NOVEMBER 20, 1957

electronics

business edition

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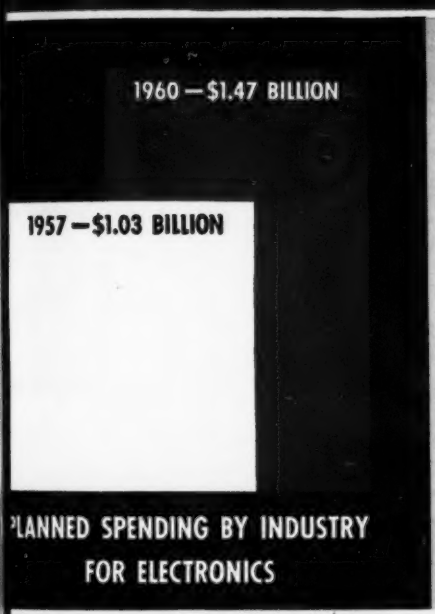
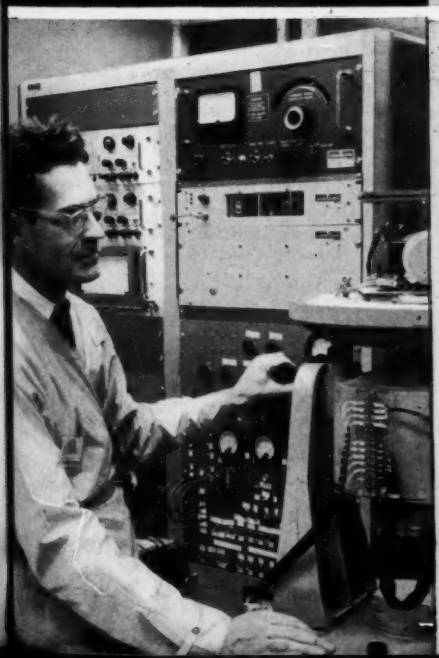


Industrial Buying To Climb 43%

Exclusive report discloses growing market for electronic gear . . . . p 16A



Inertial Guidance Techniques Lag

Latest guidance system for Titan ICBM includes radio correcting link . . . p 13

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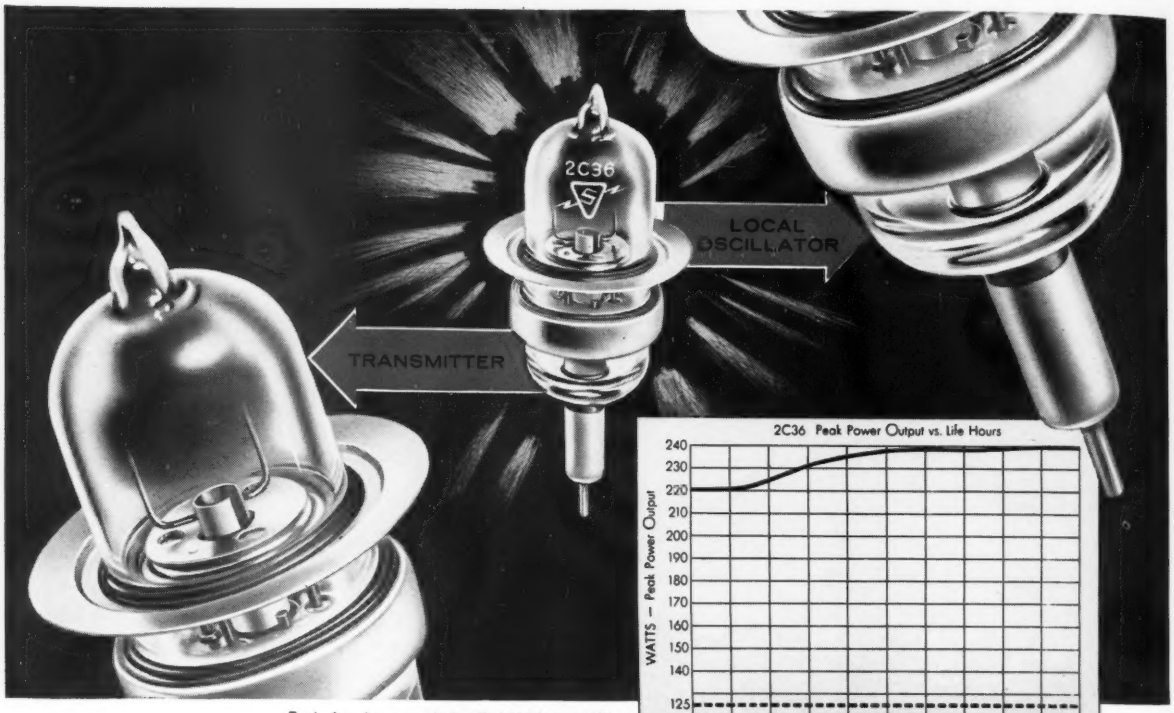

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Merger Fancies Shift

Compatibility becomes important factor in evaluating mergers. Conglomerate mergers lose favor.

THE TREND now is toward compatible mergers. It is away from the previously popular conglomerate mergers which created large diversified companies composed of many unrelated parts.

Acquiring companies now look for merger opportunities that will fit in with their operation, are reasonably sound and which they can manage.

In short companies are now concentrating on building long run profits rather than merely adding to size.

Munro Corbin, vice president of Rockwell Manufacturing summarized the present viewpoint on mergers recently at the American Management Associations' merger conference.

"The most important consideration in our evaluation of an acquisition candidate is compatibility with our own company."

In the past, merger-makers were often more interested in how to acquire an electronics or other growth company at a good price. Whether or not the acquiring company knew anything about the industry was a secondary consideration.

However, a number of acquiring companies have learned there is more to running a technically advanced company than dreaming of the big profits to be earned in the coming world of technology.

The new watchword is, "Beware of corporate indigestion."

Firms are urged to examine merger candidates for: conflicts in corporate policies, personnel policy differences, conflicting types of financial controls and unusual financial requirements, and disparity in sales organization or methods and possible competition with existing products.

Favorite example of the kind of a corporate stomach ache that can result when symptoms are not heeded is the case of a company which had a very successful pre-war history.

Right after the war it went into a broad diversification program producing a conglomeration of diverse products. Sales zoomed. But earnings fell through the floor. In 1956 it made $10 million on its pre-war products. But lost $20 million on its so-called diversified products.

The change in merger trends has not resulted in any reduction of mergers involving electronics firms. Rather, mergers in which electronics firms figure currently appear to be occurring at a faster rate than ever.

One of the principal reasons for the high rate of mergers is the inflationary spiral, said Earl D. Johnson, General Dynamics vice president, at the AMA conference. It places a constantly increasing demand for cash on all business. On the cash-hungry electronics business it places especially heavy demands.

Our industry is also feeling the effects of the trend in other ways. In the past many electronics firms merged with nonindustry or diversified firms. Now the acquiring company usually is either in electronics or a closely related field.

Desire to participate in booming missile business stands out in many of today's electronics mergers.

Many have been initiated by companies which want to get a toe in the missile door. Many others are companies that already are in missiles to some extent, but which want to broaden their missile abilities.

The desire to build up an organization capable of taking on missile system contracts and even complete missile contracts is strongly noticeable.

SHARES and PRICES

NUCLEAR instrumentation represents the electronic industry's opportunity to share in the growing atomic energy business. The Atomic Industrial Forum expects that by 1963 annual instrumentation sales may hit $135 million.

Typical Nuclear Instrumentation Manufacturers	Recent Price	Dividend Rate	Percent Yield	Earned per Com. Share 1957	Earned per Com. Share 1956	Traded	1957 Price Range
Baird-Atomic	10½[1]	....	....	0.04 (6 mos)	0.75[5]	OTC	.....
Beekman Instruments	30½	[2]	....	0.16 (yr)[3]	1.36[3]	NYSE	26⅞–47¾
Nuclear-Chicago	14¼[1]	....	....	0.88 (yr)[4]	0.70[4]	OTC	.....
Perkin-Elmer	22[1]	....	....	0.79 (9 mos)	0.59[5]	OTC	.....
Tracerlab	4⅝[1]	....	....	d-0.55 (3 mos)	d-2.93	OTC	.....

[1] bid [2] stock dividend [3] Fiscal, Sept. 30 [4] Fiscal, Aug. 31 [5] Fiscal, July 31

Expansion Push Seen

Rash of stock issues due as small firms try to become prime contractors

AN OLD ADAGE, "If you can't beat them, join them," has special meaning for many electronic firms today.

Defense department preference in letting prime contracts with full responsibility for a weapon to one manufacturer is giving current meaning to the adage. A natural result of application of this preference is that many former prime contractors may have to become sub-contractors.

Rather than accept the sub-contractor role, a number of firms prefer to expand so they, too, may become large enough to take on prime contracts.

Therefore, look for a rash of new stock issues by small and medium-sized electronic firms when the stock market resumes its rise, says Hugh McDonald, president of McDonald, Holman & Co., New York underwriters. Stock issue plans for this purpose were one of the hottest subjects of hotel room discussions at the WESCON show last summer.

Many firms were all set to embark on a program of buying or build themselves up to systems contractor size when the drop in security prices put a crimp in their financing plans, McDonald says.

The case of Daystrom illustrates how sub-contractors can develop into systems contractors. Though one of the largest electronics firms in the nation, Daystrom's missile business in the past has been limited to sub-contracting work.

Last month, Daystrom president Thomas Roy Jones, told the New York Society of Security Analysts that his firm is now seeking prime missile system contracts. Immediate aim is missile guidance and control systems. Eventually Daystrom expects contracts for the complete missile.

"We now have the facilities, personnel and experience required," Jones reports.

He is able to make this statement because of the acquisition this year of Transicoil Corp. and previous acquisitions of American Gyro Corp. (now Daystrom Pacific Corp.) and Weston Electrical Instrument.

Transicoil makes servos. Daystrom-Pacific turns out gyroscopes, missile potentiometers and computer components. Weston produces specialized instruments and testing equipment.

MERGERS, ACQUISITIONS and FINANCE

• **Stavid Engineering,** Plainfield, N. J. is manager of a group of four electronics firms that has won a team bid prime contract for missile counter measures. This is believed to be the first jointly bid prime contract to have been awarded in the electronics industry. The award was made in July and the team is working on the contract. But, the news has not been made public until now.

• **Jefferson Electric,** Chicago area electrical manufacturer, moves into the guided missile field by purchasing assets of **Electronics Products** of Santa Barbara, Calif. Acquired company makes custom cables and electronic assemblies for guided missiles. The purchase price was about $650,000.

• **Kaiser Industries** purchases assets and business of **Kaiser Aircraft & Electronics Corp.** previously a wholly owned subsidiary of **Willys Motors.** Business will be conducted under the name **Kaiser Aircraft & Electronics Division** of Kaiser Industries with offices at Oakland, Calif. Kaiser Aircraft & Electronics has machining and aircraft subassembly operations at Richmond and San Leandro, Calif. It also has electronics laboratories and other facilities at Palo Alto, Calif., Toledo, O. and Phoenix, Ariz.

• **Taylor Instrument,** Rochester, N. Y. calls off a proposed right offering to stockholders. Unsettled market conditions was given as the reason. The company had registered 99,915 common shares with the SEC and had proposed to offer shareholders rights to purchase one new share for each four held. Proceeds were to be used to retire short-term bank loans and to add to general corporate funds.

• **International Glass Corp.,** Culver City, Calif. officially changes name to **Monogram Precision Industries.** All electronics activities are now combined in the **Cascade Research Division.**

• **Smith-Corona** offers $4.2 million of 6 percent convertible debentures for subscription by common stockholders. Shareholders can buy $100 of debentures, due in 1978, for each 20 shares held. Proceeds will be used for expansion, working capital and other purposes. Lehman Brothers heads the underwriters.

• **Hitemp Wires** of Westbury, N. Y. acquires **Union Plastics** of Secaucus, N. J., fabricator of coated wires and cables.

• **Thiokol Chemical,** Trenton, N. J. plans a two for one common stock split. It has also declared a five percent stock dividend on common, payable today.

• **IBM** declares a 2½ percent stock dividend to be paid in January. No stock dividend was declared at this time last year. But 2½ percent was distributed in Jan. 1956.

• **Cook Electric,** Chicago, Ill., plans a two for one common stock split. The number of outstanding shares has been increased to provide for the stock split and to prepare for a planned common stock offering. Proceeds of the offering will be used for expansion.

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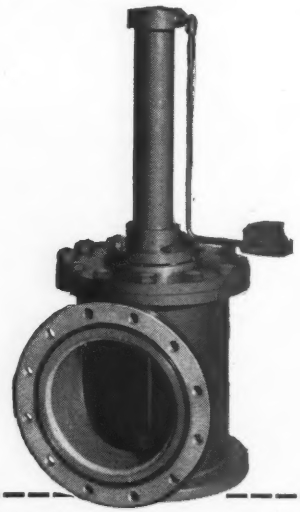

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WASHINGTON REPORT

JAMES R. KILLIAN's exact role in the ballistic missile program is still not clarified. But the President's new "Special Assistant for Science and Technology" at the outset did not appear to be the "missile czar" that the administration's defense critics have been clamoring for. His charter of authority makes it seem unlikely that he will be "knocking heads together" to expedite missile development.

A stronger likelihood is that Killian will act as a gadfly in the missile program—probing into bottleneck projects, proposing changes, directing highest-priority research. Some military missile experts groan that Killian's appointment just adds another layer of coordination in what is already an "over-coordinated" chain of missile command.

But Killian has the political stature and Washington savvy to push ballistic missile development faster. He'll have no direct control over the missile budget, however, and presumably will be tied down also in general scientific affairs not specifically related to the missile program.

A more significant development may be the President's order to strengthen the authority of the Defense Secy.'s Special Assistant for Missiles, William Holaday, and to put new missile programs under a "single manager."

The administration has relaxed the Pentagon's tight budget restrictions. The $19 billion military expenditure ceiling for July-December 1957 has been boosted by $400 million—$300 million for the Air Force, the remainder for the Navy.

The action will hold off new stretchouts in aircraft and electronic production in the works under the Air Force's recent order withholding portions of monthly payments.

The administration's action does not necessarily reflect the frenzied political reaction to latest Russian missile exploits. Pentagon insiders say it is simply official recognition of what most Defense Dept. budget officials have been saying for weeks: that fiscal 1958 defense expenditures cannot be kept under the $38 billion ceiling.

● **Amidst** all the furor over the Sputniks, the Pentagon is working up next year's military budget under administration "policy guidance" to plan both fiscal 1959 expenditures and new appropriation requests in the $38 to 39-billion range. This is roughly the same as this year's levels, though Congress cut the appropriation some $2.5 billion.

But privately, some Defense Dept. officials are reconciled to the fact that Congress will tear the new military budget to shreds. They feel that if the political pressures continue unabated, what will come out next year will be a congressional military budget that will provide more defense money than the White House expects to seek.

With at least two congressional investigations starting up into the ballistic missile program (see p 33), there is still time for the administration to pull a big policy switch in defense. At press time, there was no sign of what—if anything—the White House will do in reaction to the growing clamor for a revamping of the ballistic missile program and other key elements of defense policy. Principal target of the critics: the administration's determination to tie defense policy to fiscal considerations.

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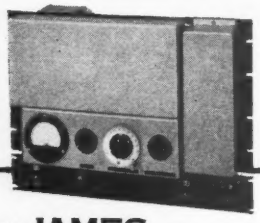

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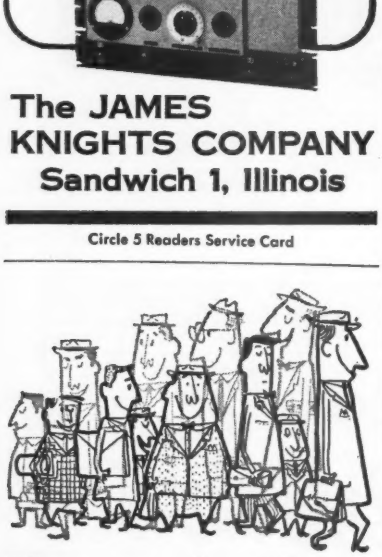

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EXECUTIVES IN THE NEWS

Patterson: somewhat unwilling . . .

NEW PRESIDENT of Bulova Research & Development Corp. is R&D executive Everett M. Patterson, 51, who moves in from a research vice presidency at Standard Thomson. For a man who says he's become a manager "somewhat unwillingly," he displays an almost unbelievable zest and vitality in the job.

Westerner Patterson hails from Colorado Springs, took a BSChE in 1928 at University of Montana. From 1929 until mid-1942, he did what he calls "honest scientific work," first for Bell Laboratories, then for the wartime National Defense Research Committee.

After his stint with NDRC, he became director of research for U.S. Time Corp. When the war was over, he set up and directed Eversharp's research arm, later bought it, renaming it Patterson-Moos. Through running his own research firm, he learned finance and other phases of management—by expediency, "plus luck." He sold the firm in 1954, took over Avien's engineering operations, moved over to Standard-Thomson two years ago.

Bulova R&D presents "considerable challenge," he believes. He likes the watchmaking company's approach to research, revels in the labs' wide variety of interests. He brings one unusual faculty to Bulova: an uncannily accurate memory for dates and times.

Patterson is "very much married," with three sons—two in prep school and a three-year-old—devotes part of his free time to his house and garden. Basically a moderate, he eschews both rock'n'roll and the heavy classics, prefers American jazz. He plays chess "moderately well," reads three or four novels a month, likes fishing (tuna, moderate-sized, off Montauk Point, L. I.) and horseback-riding.

LETTERS

Sounds

I read with much interest the article "Sounds from Space" (Oct. 20, p 14).

Having done much of the work on the satellite-tracking antennas, which were produced by Technical Appliance Corporation for the U.S. Naval Research Laboratory, I would like to make a correction.

These antennas were tuned to operate at 108 megacycles, instead

of 180 megacycles as indicated.

ROBERT T. LEITNER
TECHNICAL APPLIANCE CORP.
SHERBURNE, N. Y.

Low-Rated Technicians

To one engrossed in human relations, the article "Rating the New Man" (Oct. 20, p 17) was most interesting.

We must face it, our country is wasting good technical intelligence by our apparent inability to place personnel properly. There must be thousands of highly adept technically-minded men across the land who are working at jobs below their potential.

These men, for any number of reasons, may not have acquired a formal degree. It would be in the interest of the nation's welfare, and the welfare of industry, to devise some system for hiring and placing technical employees such as you describe.

J. G. WININSKY
WININSKY LABORATORIES
SHARON, PA.

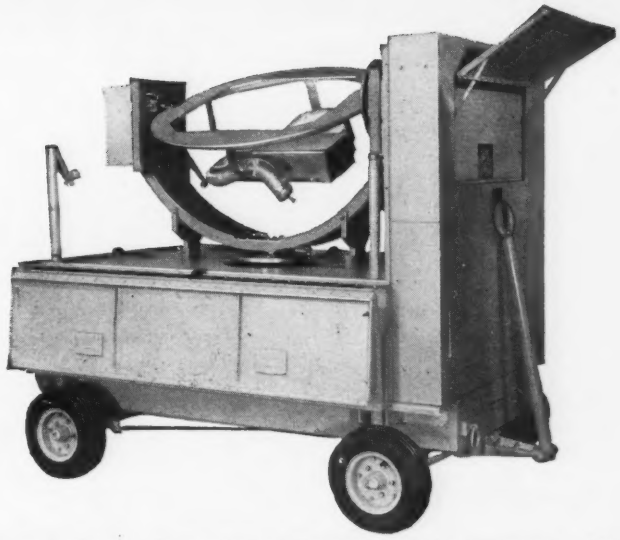
Mixed Pix

We were quite surprised to see a picture of our radioastronomy antenna used as an illustration for an article about the Jupiter research conducted by Boulder Laboratories of the National Bureau of Standards ("Report from a Large Planet," Aug. 10, p 40).

While we are glad to say we know these men and their work, we would like to point out that the illustration shows the erection of one of the steerable trihedral corner reflectors built by employees of the Research Service Laboratories of the University of Colorado. Two of these antennas are now being used by the High Altitude Observatory, University of Colorado, for tracking the Russian satellite. The ultimate purpose is to use the antennas in a radio interferometer to study the ionosphere.

LOWELL H. LEMOINE

UNIVERSITY OF COLORADO
BOULDER, COLO.



New servo-controlled "Tilt Table" for missile guidance testing

This Thompson-engineered mobile unit aids in the functional check of an intercontinental missile's internal guidance gyroscopes. It generates angular position and velocity inputs to the gyros. Unit consists of electro-mechanical assembly, electronic pre-amplifiers and pick-off amplifiers, and quadrature rejection unit. Two-gimbled support structure will carry a 125-lb. guidance package.

New Actuator operates for 100 hours at 550°F submerged in jet fuel

Pictured is a new Thompson-developed actuator used in missiles. It consists of motor, gearing, feed-back pick-off and jacket. Unit has been tested for 100 hours of operation at 550°F submerged in jet fuel. Power output is 10 watts (mechanical). Torque output is 150 inch-ounces at 30 rpm at 550°F. Servo performance in conjunction with a computor produces a positional accuracy of ±½ degree. Approximate size: 3″ diameter x 4″.

Call on Thompson for development and production of electronic control sub-systems and components, countermeasures and microwave components. We invite your inquiries.

ELECTRONICS DIVISION

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27E	5	1⅛	⅝	5,500 Ω	30,000 Ω
28E	10	1⅞	⅝	12,000 Ω	50,000 Ω

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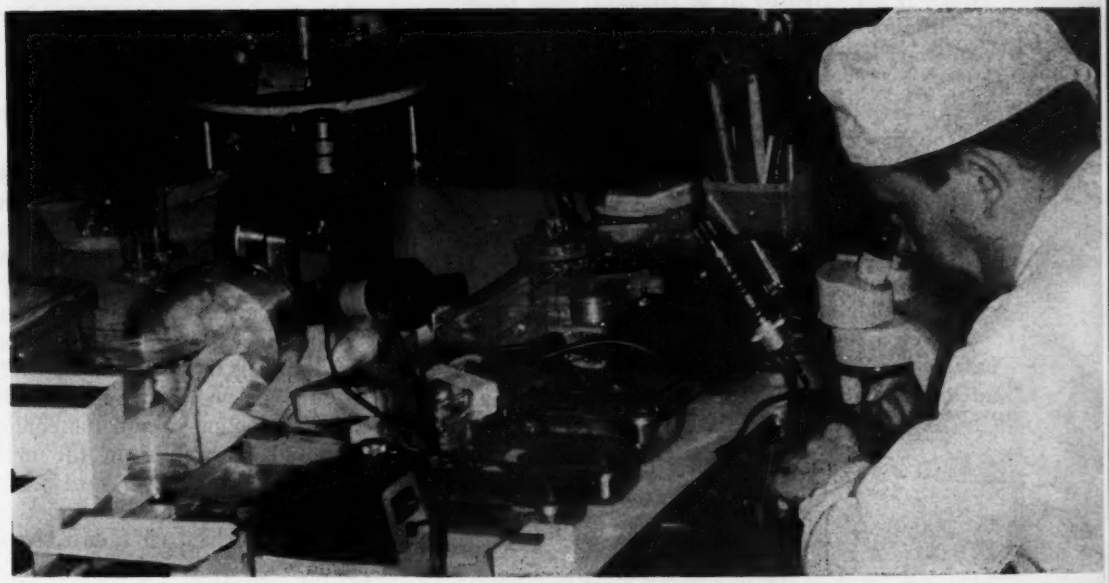
NOVEMBER 20, 1957



Despite progress in components . . . .

Inertial Guidance Skills Lag

- **New guidance system contract for Titan ICBM reveals U. S. must depend on radio signals**
- **Missile tracking at U. S. base in Turkey indicates the Russians may be having similar problems**

DESPITE CONTINUED progress in getting ballistic missiles off the ground and into space, the fact remains today that neither Soviet nor American models are coming down again in the right place.

Nevertheless, efforts to guide and control a ballistic missile from launching to target have become a $250 million a year business, 25 percent of the $1 billion spent on ballistic missiles during the past fiscal year.

The guidance system getting most of this $¼ billion is inertial. Most U.S. long-range missiles use inertial for basic stand-by guidance and control.

An inertial system is fundamentally a dead-reckoning device that measures time, gravity, acceleration and angular velocity by sensing devices and without use of any radiation data. Major elements are gyros, accelerometers, integrators, servo mechanisms and computers.

However, inherent system complexity creates errors that multiply with time. Therefore a separate navigation system is needed to correct periodically the inertial navigation. It is doubtful that any ballistic missile would be sent off at this time using inertial alone.

Great progress is, nevertheless, being made. In two years, drift in Sperry's Gyrosin compass system was reduced from eight degrees to three; during the

last year drift was brought down to ¼ degree.

Auxiliary systems currently used in ballistic missiles are radio command from the ground and stellar and doppler in the missile.

USAF's ICBM Titan and IRBM Thor will both use radio-inertial guidance. (Western Electric's contract for this work totaling $104,192,000 was finalized last month. Actual work will be done by BTL.) Polaris is also reported to be equipped with radio-inertial. Snark uses inertial and stellar—strategically good since neither system emits radiation.

Ground guidance of Titan will be done by tracking the missile with long-range radar or by radio direction finders and comparing missile's position with the programmed flight plan on Univac Scientific computers (Remington Rand got $24-million contract for computers for Titan last month); and sending commands to correct missile's guidance systems over h-f radio.

It is even conceivable that to achieve the critical entrance-to-the-ballistic-trajectory-point a friendly satellite or orbiting space station could give an ICBM a last minute heading correction.

As for the competition, there is reason to believe U.S. tracking of the Soviet missiles from "radar stations" in Turkey may actually have been aided by radio direction finders picking up doppler navigation signals from the missile rather than by long-range "sightings" alone.

Two technical obstacles to guiding an ICBM from the ground are attenuation of the command signal by ionization of the gases in the rocket's flame, and microwave refraction in clouds that give erroneous position data to a tracking radar. These are two good reasons for having inertial to fall back on during such communication black outs.

Besides the certain and continued business in the field of ballistic missiles (total initial capital outlay for one ICBM wing is expected to reach $1 billion), inertial producers are also active under USAF and Navy contracts in developing inertial systems for aircraft, ships and submarines.

A side of the tent revealing more of the top-secret inertial show may be slightly lifted next month when excerpts from progress reports on the USS Compass Island's ship's inertial navigational system, SINS, built by Sperry (Electronics, Jan. 20, 1957), are expected to be released.

Also to be announced at that time is that "several more inertial systems of different designs will be installed on the Compass Island for evaluation and comparison." How much is being spent on Compass Island is not released. Before it was launched last December, initial equipment cost was running close to $4 million.

Defense Department has been extremely tight-lipped concerning inertial activities. Only three official announcements have been made to date: (1) Navy is testing inertial on Compass Island; (2) MIT navigated successfully a B-29 with airborne inertial from Boston to Los Angeles in 1953 (this news came out in April 1957); and (3) ballistic missiles use inertial.

It is known in the airborne field, however, that MIT is working on inertial systems for bombers, fighters and helicopters. Sperry holds large contracts for production of airborne equipment. And Minneapolis-Honeywell is in the initial stage of developing an inertial system for USAF fighters.

At least eight firms are making complete inertial systems which go from $1 million for development to $125,000 for follow-up production: A.C. Spark Plug, Arma, Kearfoot, Litton Industries, Minneapolis-Honeywell, North American, Northrop and Sperry.

A typical system might contain three gyros, two accelerometers, four integrators plus the many computing elements and servos. Half the cost goes for gyros, accelerometers and integrators with the rest for computing elements and servos.

About 15 companies currently produce and have on the market gyros and accelerometers. Included are: Giannini (sales for 1957 hit $3.5 million), Greenleaf, Kearfoot, Minneapolis-Honeywell, Reeves and U.S. Time (see photo). The last named, as well as other component producers, also have over-all inertial systems for long-range missiles currently in design and development phase.

COMPONENTS USED IN INERTIAL GUIDANCE SYSTEMS

GYROS	ACCELEROMETERS	INTEGRATORS	COMPUTERS
Single-degree of freedom fluid floated	Magnetically-restrained pendulous	Viscous shear	Analog
Two-degree of freedom fluid floated	Elastic-restrained pendulous	Drag-cup	Electro-mechanical analog
Air-bearing suspended	Linear displacement	Integrating servo	Digital
Torsion-wire suspended	Integrating	Thermo-	.....
Gas-floated	Double integrating	.....	.....

'Moon' Keeps its Secrets

• Dog-in-the-moon is a dog-in-the-manger. Preliminary reports suggest that Sputnik II transmitted its important data—multiplexed and pulse-modulated—over the Eastern hemisphere. Monitor stations here were getting mostly c-w

SPUTNIK II (or Muttnik, as the wags are calling it) was selectively transmitting two different kinds of data with a transmitter believed to be powered by the sun.

One of the signals was apparently a multichannel f-m signal, the other pulsed. How the transmissions were programmed is an unanswered question. Tentative comparison of monitor reports from Europe, Africa, and North America indicate that pertinent information was being transmitted only in the Eastern hemisphere.

Army Signal Corps first picked up the sounds of Sputnik II at its big listening post in Deal, N. J. at 2:50 a.m. Sunday Nov. 3. It was an unmodulated c-w signal at 20 mc.

Next pass, at 4:29, the monitors at Deal heard a minute-long signal modulated "differently" from anything that had come out of Sputnik I. They didn't record it, but listeners said it possessed some of the characteristics of an f-m multiplex.

Following this pass, Moscow announced that the dog was safe. RCA Communications' listening post in Tangier reports a several-minutes-long tone on the satellite's transmissions that time around.

At 6:10 over the U. S. the tone was coded—"keyed," a Signal Corps spokesman termed it—132 pulses, approximately evenly spaced, to the minute. Signal Corps officials say the pulses were "apparently modulated" with an information envelope. The 6:10 signal was the strongest signal the second satellite produced.

On the same pass, cw transmissions began on 40 mc. Two passes later the 20 mc signal received by U. S. monitors went on cw and stayed there for about 20 hours. Next day the signal was briefly modulated again with a tone described as "fuzzy."

Says one monitor: "It was multiplexed type of signal with several channels of information. Couldn't decipher it without the right multiplex gear."

Everybody agrees that transmissions from Sputnik II were not so strong as the first satellite's signal. Weakness of the signal probably resulted from the fact that, according to reports from Moscow, solar power was being used to drive the transmitter.

Another mystery locked up in the Defense Department is the identity of the signal at 14.286 mc. This signal, first heard by hams monitoring the satellite, was "of a different pattern" from any Sputnik signal. FCC knows but will not disclose who was doing the transmitting on the adjacent frequency, and Defense officials decline comment.

The mystery signal couldn't be meant to jam, was either a reference to guide monitors to the fluctuating Sputnik signal or some sort of probe.

After the first two days, the 20 and 40 mc signals received here were almost exclusively unmodulated cw. Every so often, one pass briefly transmitted either the tone or the rapid beeps. Although monitor reports are tentative, it seems that what U.S. listeners heard was the beginning or end of a modulated signal.

Western hemisphere network of Minitrack stations missed most of Sputnik II's message

Reports from Europe and Africa tell of modulated transmissions on both 20 and 40 mc which lasted for up to 20 minutes. These reports suggest that a programming device was dumping the information only over the Eastern hemisphere.

Scientific objectivity of the Russian experiments is questionable anyway. Both transmission methods and frequencies were different from the ones on which nations participating in International Geophysical Year programs had agreed.

Awards Get A New Look

Several companies offer extra money and even a share in the profits to get engineers to think creatively. Still other companies feel that coming up with ideas is part of an engineer's job. Keen competition in our industry now makes raw ideas increasingly important

RIGHT now many electronics companies are rubbing their heads in the painful morning-after a seven-year government spending binge. A big part of their king-sized headache is meeting competition.

Competition puts a high premium on new ideas and new products. Far up the list of management problems in our industry is the problem of stimulating engineers to think creatively. Companies have cloistered their engineers in beautifully landscaped laboratories, brought them together in brainstorming sessions, arranged special symposiums for them.

But at least some companies think extra money may, after all, be the best incentive for getting new ideas out of engineers.

Several companies queried by our West Coast editor indicate that yesteryear's suggestion-box gratuity no longer does the trick. The trend in many firms: let the inventor share in the gains from his patentable ideas.

A case in point: Lear, Inc. recently inaugurated a plan granting the engineer royalties on the licensing or sale of his invention. When a patent is licensed to another company, the inventor gets 10 percent of net cash royalties until he has received $5,000. Royalty rate decreases to 5 percent for the second $5,000, then to 2.5 percent for the third. After receiving $15,000, he continues indefinitely to pocket 1.5 percent on subsequent royalties. Resignation from the company at any time does not affect the inventor's share of the profits.

In addition, Lear follows the more conventional procedure of an award to the inventor when it files for the patent ($25), and another when the patent is issued ($50).

Beckman Instruments made an extensive survey of current incentive awards systems. The result of its study: a two-prong policy for sparking the creative drive. When Beckman files for a patent, the inventor gets $100. But the big premium comes once a year when the Beckman Award of $1,000 is given to the most outstanding invention.

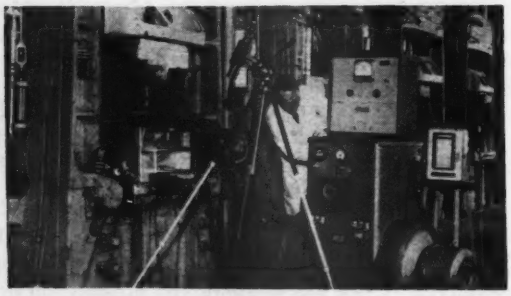
Of 27 leading firms questioned by Beckman, a large minority give no bonus when invention disclosures are made or when patents are issued. Fourteen give a bonus when the patent application is filed. Most of those companies granting bonuses indicated this practice is a definite stimulus to invention.

Northrop sets up two categories for inventors: engineers, researchers, designers, etc., and executives making more than $7,500 yearly; all others.

Northrop's first group of inventors share royalties on a basis similar to the Lear plan. The others get $50 at time of filing and $50 more when the patent is issued. Twenty percent of net profits from the licensing or sale of the patent by Northrop is also granted inventors in this second group. If the company doesn't want to use the invention, all rights are released to the inventor, except Northrop's right to use it in its business.

Further, if the suggestion or invention received by Northrop increases efficiency, savings in dollars are figured and the idea man gets 10 percent of the resulting annual economy. The plan works well; since 1946, 20,000 suggestions, of which many have led to inventions, have been put into the Northrop suggestion box.

North American reports that most of the ideas it gets for inventions come through the suggestion box. Here, too, the practice is to give inventors a flat fee when patent application is made. Royalties follow on a varying scale, if patent is licensed or sold.



Pre-Flight Infrared

Infrared pyrometer made by Servo Corp. of America monitors resistance heating of titanium sheet at Republic Aviation. Heat control allows tricky titanium heating right in drop hammer, bypassing production furnaces.

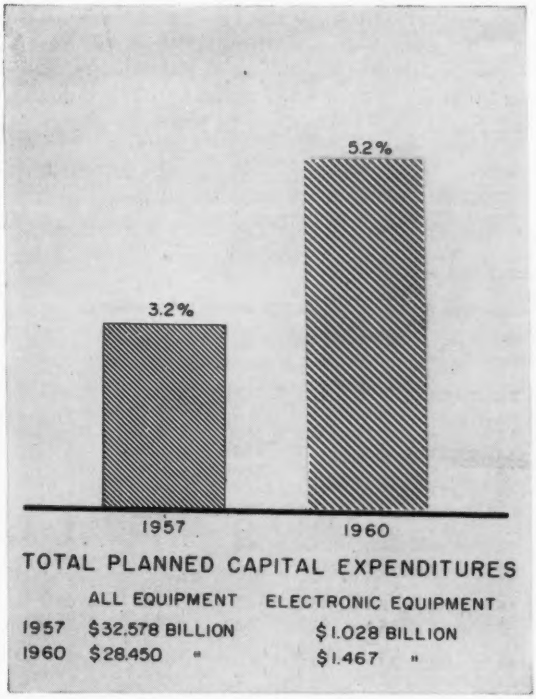
SPECIAL MARKET REPORT

INDUSTRIAL ELECTRONICS: 1957—1960

By Edward DeJongh—Associate Editor, ELECTRONICS

- **Electronics getting $1.03 billion of capital expenditures by major industries this year and $1.47 billion in 1960**
- **Record-breaking $7.3 billion R & D spending spree helps electronics swim against ebbing capital goods tide**

AMERICAN industry is rapidly becoming a bigger and better customer for electronic equipment—and industry spending for electronics may jump 43 percent in just three years.



ELECTRONICS' SHARE OF CAPITAL EXPENDITURES GROWS (commercial firms excluded.)

Expenditures by major industries totaled $1.028 billion during 1957, according to an ELECTRONICS survey. And the outlook for 1960: $1.467 billion.

These figures represent capital expenditures for electronic equipment by 17 industrial groups. The survey covered 200 bellwether companies in manufacturing, transportation, mining, petroleum and communications fields.

A closer look at what the same industries will spend this year and in three years for all capital goods makes the electronic equipment part of the picture glow even more promisingly.

Their total spending during 1957 will hit $32.6 billion. Electronic's share is 3.2 percent. As for 1960, the electronics industry does more than show a gain; it swims successfully against the tide. Preliminary spending plans are 12.6 percent lower. But electronics' portion will rise to 5.2 percent.

Actually, these are minimum figures. The 17 industrial groups surveyed do not include large commercial users of electronic equipment such as motion-picture theaters, insurance companies, banks and merchandising firms.

Furthermore, the figures include only dollars used to actually buy electronic equipment. There is also a large rental market in equipment such as electronic computers.

WHY THE RISE? — —

Here are reasons why electronics spending by industry is on the increase while overall capital spending by industry is momentarily declining:

In recent years, most capital spending by industry has been to increase productive capacity. This kind

of spending is temporarily on the wane. Electronic equipment, on the other hand, helps industry get more out of existing productive capacity. And at lower cost. This kind of equipment is in increasing demand today.

As industry in general gears up for an era of more intense competition, industrial research and development assume increasingly important roles. This year industry will spend $7.3 billion on R&D. Industry will spend more next year, still more in the years to come. In modern R&D much electronic equipment is essential.

WHAT THEY'RE BUYING — —

Manufacturers of communications equipment are still getting the biggest slice of the electronics capital expenditure pie. A total of $333.1 million is expected for 1957 and $482.6 million—a leap of $149.5 million —is planned for 1960.

Industrial controls, with $276.1 million scheduled for expenditure this year and $386.6 million for three years hence, is in the number-two spot size-wise. It'll jump $110.5 million.

Planned test instrument purchases for 1957 are $226.7 million. They will climb $102.4 million— to $329.1 million—by 1960.

Figures reported for data-processing equipment show that many previous estimates of sales in this field have been conservative. Even though both value of rental equipment and sales to banks, insurance companies and merchandising firms were excluded, American industry still reports it will spend $192.1 million on data processing equipment this year. Some $268.7 million in purchases are forecast for 1960, a boost of $76.6 million.

Despite the impressive climbs seen for four parts of the electronics industry, these segments, surprisingly enough, will shift very little volume-wise in relation to each other. This table shows:

Share of Electronic Equipment Expenditures

	1957	1960
Communications	32%	33%
Industrial Controls	27%	27%
Test Instruments	22%	22%
Data Processing	19%	18%

WHO BUYS IT — —

The biggest spender for industrial electronic equipment is the "Other Transportation and Communications" group. In this division are air, truck and ship lines, telephone, telegraph and broadcasting companies. This group accounts for nearly half of all electronics capital expenditures. It will spend $496 million on electronic gear this year and $743 million in 1960. The increase here: $247 million.

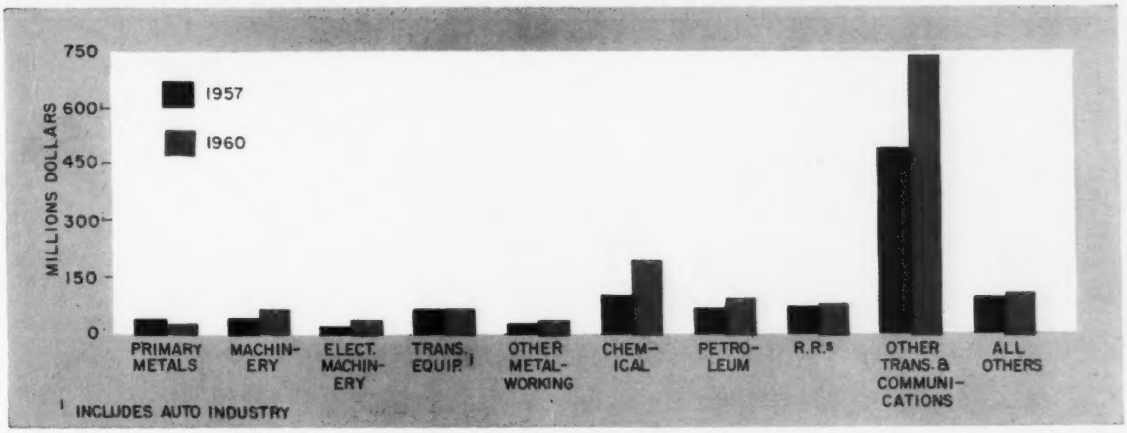
The second biggest investor in electronic equipment is the chemical industry. Its current investment is $114 million. Planned spending for 1960 is $198 million, a leap of $84 million.

Other important buyers of electronic gear, and how their spending will go up from 1957 to 1960, are these industries: petroleum ($62 million to $91 million), railroad ($68 million to $80 million), transportation equipment ($66 million to $70 million), and machinery ($45 million to $66 million).

PLANNED CAPITAL EXPENDITURES FOR ELECTRONICS

Industry Group	Test Instruments		Communications		Data Processing		Industrial Controls		All Equipment	
	1957	1960	1957	1960	1957	1960	1957	1960	1957	1960
	(Millions of Dollars)									
Primary Metals	$ 3.9	$ 1.4	$ 9.8	7.5	$ 7.8	$ 6.7	$ 17.5	$ 11.4	$ 39.0	$ 27.0
Machinery	31.5	42.9	4.5	6.6	2.2	5.3	6.8	11.2	45.0	66.0
Electrical Machinery	5.2	8.4	2.1	3.8	5.3	9.5	8.4	16.3	21.0	38.0
Transportation Equipment	6.6	7.0	3.3	3.5	6.6	7.0	49.5	52.5	66.0	70.0
Other Metalworking	9.3	12.9	2.8	4.3	1.9	4.3	14.0	21.5	28.0	43.0
Chemicals	11.4	19.8	11.4	19.8	5.7	9.9	85.5	148.5	114.0	198.0
Paper	0.5	0.8	0.5	1.7	2.5	4.3	6.5	10.2	10.0	17.0
Rubber	0.8	1.6	0.4	0.6	2.4	1.6	4.4	7.2	8.0	11.0
Stone, Clay & Glass	0.6	0.4	0.9	0.6	0.6	0.4	0.9	0.6	3.0	2.0
Food & Beverages	0.7	1.1	0.7	1.1	4.9	7.7	7.7	12.1	14.0	22.0
Textiles	5.0	6.5	—	—	—	—	5.0	6.5	10.0	13.0
Miscellaneous Manufacturing	1.2	1.5	1.2	1.5	6.3	7.5	16.3	19.5	25.0	30.0
Petroleum	21.7	31.8	6.2	9.1	3.1	4.6	31.0	45.5	62.0	91.0
Mining	0.5	0.5	0.1	0.1	—	—	0.4	0.4	1.0	1.0
Railroads	3.4	6.4	34.0	45.6	17.0	12.0	13.6	16.0	68.0	80.0
Other Transportation & Communications	124.0	185.8	248.0	371.5	124.0	185.7	—	—	496.0	743.0
Utilities	0.4	0.3	7.2	5.3	1.8	2.2	8.6	7.2	18.0	15.0
All Industry[1]	$226.7	$329.1	$333.1	$482.6	$192.1	$268.7	$276.1	$386.6	$1,028.0	$1,467.0

[1]Does not include commercial firms such as banks, insurance companies and merchandising houses



CAPITAL SPENDING PLANS OF INDUSTRIAL GROUPS

The Other Transportation and Communications group is the heaviest spender for test instruments, communications and data processing equipment. No plans for industrial-control purchases were reported by this group. Even so, the group's 1960 total spending hits an impressive $743 million. Here, in the three segments reported, is what the group spent this year and plans to spend in 1960: communications, $248 million-$371.5 million; test instruments, $124 million-$185.8 million; data processing, $124 million-$185.7 million.

Second major spender for test instruments is the machinery industry. Instrument expenditures will total $31.5 million this year and $42.9 million in three years.

The railroad industry is the second-ranking purchaser of communications equipment. It is spending $34 million in 1957. It plans to spend $45.6 million in 1960. The same industry also ranks as runner-up buyer of data processing equipment, spending $17 million in 1957 and—the first drop noted—$12 million in 1960.

Top user of industrial controls is the chemical industry. It leads with expenditures of $85.5 million for this year and planned expenditures of $148.5 million for 1960. The petroleum industry, with $31 million scheduled for outlay on industrial controls in 1957 and $45.5 million in 1960, holds the number two position among buyers of this type of equipment.

NEXT YEAR — —

On the overall picture, preliminary results of the McGraw-Hill 1958 Survey of Business Plans indicate that planned capital expenditures for next year will be down a few percentage points—probably seven. This would be the first year since 1954 in which capital expenditures have failed to increase over the preceding year.

Such a drop, if it happens, may startle businessmen accustomed to the past parade of steady increases. But, as Dexter Keezer, McGraw-Hill director of economics, explains:

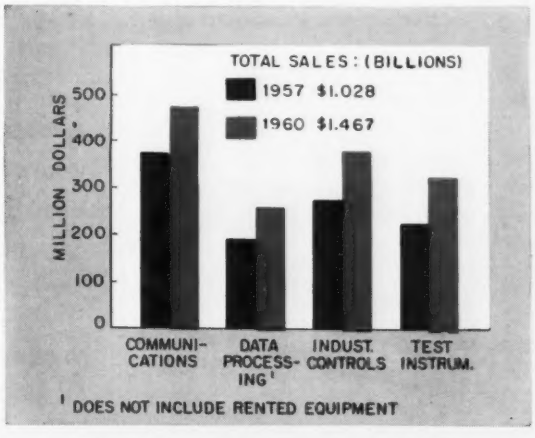
"Actually business investment will be going ahead at what only a few years ago would have seemed an unbelievably high rate."

Possible slight drop or no—American industry likes and wants electronic equipment. Right now, 43 percent more in three years.

RISE TO RESUME — —

Industry's plans to maintain and even increase research and development expenditures points to new record capital expenditures in the near future. Capital investments will probably be up again by 1960 and continue well into the '60s, Keezer says.

There is normally a seven-year lag between the time money spent on research and development of new products and processes is translated into capital expenditures. The boom in research has been going on since 1954. Last spring, industry reported planned R&D expenditures for 1960 which totaled $9.3 billion.



WHAT INDUSTRY IS BUYING

All business is specialized

. . . and nothing specializes on <u>your</u> business like your business paper

Here's a smart business man. He spends his time where every sitzmark parks a prospect at his feet. It's simple sense: He *specializes* . . . and it *pays*!

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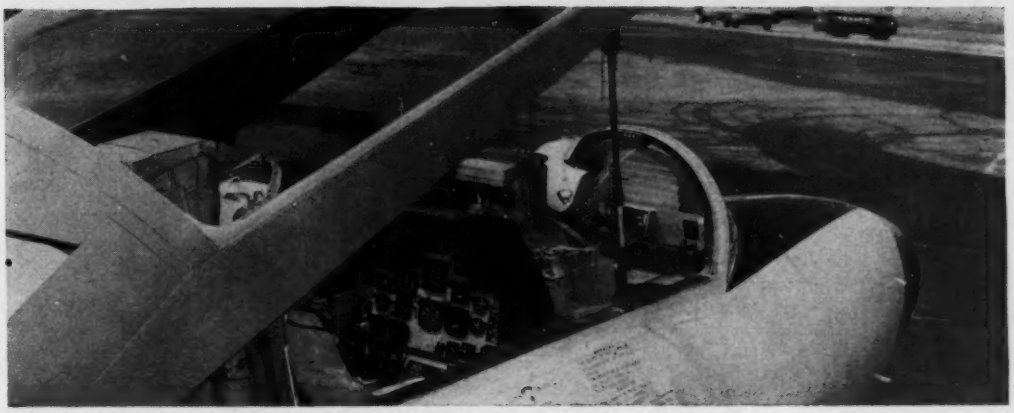

Pilots of the future will not need to read maze of flight instruments, shown in rear cockpit, because of new flight data presentation display shown in front cockpit

A New Business Is Born

• Tv-like flight data display system points to added electronics sales as services, air lines show heavy interest

• Gear features bread box-size computer (under 40 lbs.) and a revolutionary transparent tv tube (2⅝ in. thick)

TEST RESULTS out this week indicate tv-like flight data presentation will develop into a huge military and civilian business within a decade.

Impact on the electronics industry will be felt as an increasing demand for transistors (for use in computers), flat-screen crt's, and more special-purpose analog and digital computers.

Out from under the cloak of classification and now in public view is the new instrument panel called ANIP (Army-Navy Instrumentation Program).

Present design uses a special-purpose, high-speed electronic digital computer to transform input data from conventional sensing devices into signals which generate pictures on two flat-screen, transparent cathode ray tubes. The display enables the pilot to determine his ground track and aircraft altitudes as if he were looking out his cockpit on a clear day.

Navy estimates the system will be operational in their aircraft by 1959 or 1960. Army intends using a modified version in helicopters. Commercial airlines express enthusiasm. Cost: presently unknown.

Proof of the simplicity and accuracy of the entirely different instrumentation concept was furnished recently. A non-pilot successfully flew a Navy T2V-1 jet trainer without once seeing beyond the cockpit.

Responsibility for development of the Navy system (see photo) rests with the El Segundo division of Douglas Aircraft. One of the crt's in the prototype provides a two-dimensional picture arranged to give a three-dimensional perspective to terrain and sky which has been designated by the new term "contact analog". The other presents a navigational-type map display. A Kaiser-Aiken crt is used which is 2⅝ inches thick, 20 wide, and 11 high.

Signals for both contact analog and map display are provided by an electronic digital computer designed and built by Litton Industries. Smaller than a bread box and weighing only 40 pounds, the computer is capable of processing sensor data at the rate of 15,000 computations a second.

Program responsibility for the Army helicopter phase has been assumed by Bell Helicopter. Since the pictorial presentation of flight data for rotary wing aircraft presents different problems, a modified version of the Navy's program is used.

This system, instead of using a digital computer, employs a special-purpose analog contact generator designed and built by DuMont. Six general equations describing relationships between flight data parameters are continuously solved by analog computers contained in the generator. The results are displayed on either a conventional or flat-screen crt.

Presently, the Army system is being tested on a Bell-designed dynamic flight simulator.

Cmdr. G. W. Hoover, manager of the ANIP project, believes the instrument will eliminate 50 percent of plane accidents now costing taxpayers about $2 million daily.

Where Do Great Ideas Come From?

From its beginnings this nation has been guided by great ideas.

The men who hammered out the Constitution and the Bill of Rights were thinkers—men of vision—the best educated men of their day. And every major advance in our civilization since that time has come from minds *equipped by education* to create great ideas and put them into action.

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Industrial Telemeters Gain

• Military telemetering's slow-footed cousin is coming into its own as utilities and pipelines continue their record expansion

• Transmitting equipment is an $8 to $9 million market. Pipeline microwave may help, be helped by, centralized control

INDUSTRIAL TELEMETERING, though outstripped in sales and technical interest by military telemetering, is quietly building up a sizable market these days in utility and pipeline fields.

Estimates of this year's industrial telemetering volume vary widely. One source says $15 million, another $35 million. It's a matter of definition.

The lower figure includes only terminal equipment and the control and transmitting equipment directly connected. The other includes installation, any associated gear, and pipeline microwave which is also used for other purposes.

Neither figure includes applications which border on telemetering, such as in-plant process control data gatherers, traffic control and airline navigation aids.

Both agree that the prime movers of industrial telemetering are public utilities and the pipelines, two services which are straining to keep up with the American economy.

Annual rate of new electric utility construction has increased from $3.7 billion to $4.5 billion in five years and should reach $7 billion by 1962. Gas utilities capital outlay figures for the same years are $1 billion, $1.5 billion and near $2 billion.

As these utilities networks become larger and more

TECHNICAL DIGEST

• **Electronic organ** that never gets out of tune has been brought out by Kimball. It uses design by Merlin Petroff involving 12 waves-shape disks rotating in photoelectric beam systems. Recorded waveshapes of actual organs were mathematically corrected before being transferred to pattern disks, each having harmonically related notes on circles of different radii.

• **Diodes give** gain in new converter applications at Bell Labs. In an up-converter stage using a gold-bonded germanium diode, this gain was 6 db with adequate bandwidth when converting from 75 mc to 6,000 mc. In down-converters using diffused silicon diodes, conversion gains as high as 45 db have been achieved.

• **Titanium ion pump** under development at MIT combines molecular-beam techniques with gettering action of titanium to give a clean vacuum from a start at 10^{-8} mm Hg. This start can be achieved simply by using water aspirator trapped with dry ice, so that entire pumping job is done without mechanical action. Pump itself is like electron tube, having one filament of titanium, one conventional filament and a grid.

• **Whistlers,** causing interference with radio communications, occur when lightning strikes the earth and creates electromagnetic waves having frequencies from 500 cps to 20 kc. According to experimental data collected by Prof. R. Helliwell of Stanford University, these waves follow the earth's magnetic field lines into outer space and back. During the trip the lower frequencies are slowed more than the others, explaining why the interfering whistles start high and then gradually drop in pitch.

• **Glaze ice** on inflated plastic radomes up to 50 ft. in diameter can be removed effectively and inexpensively with lengths of 100-grain explosive primacord spaced about 6 ft. apart. Steel balls mounted on shafts driven by air motors, thumping radome from inside as they move around with radar spinner, also do the job. Protective radalon paint was found to be about best coating available for resisting formation of ice, in SRI research for Rome Air Development Center.

• **Light shutter** providing fraction-of-microsecond exposures is obtained by applying pulse voltages to dynodes of multiplier phototube in place of usual fixed d-c voltages. Chief use to date is for analyzing intensity variations in weak light flashes. In circuit developed by Philips Labs, pulse generator feeding dynode voltage divider is triggered simultaneously with pulse generator feeding light source. Phasing of pulses is adjusted to analyze any desired part of flash.

• **Hard anodizing** process electrically insulates components from chassis and conducts heat away from components. Hughes, co-developer of the process with Anachrome Corp., is using it for radar test equipment chassis. Dielectric tests at 500 volts indicate anodized film's resistance is several thousand megohms. Heat transfer ability allows elimination of silicone oil or mica washers in transistor heat sinks. Power rectifiers may also be directly mounted to chassis. Hardas process is used.

complex, the need for centralized control becomes keener.

Gas transmission companies, who run the big pipelines, have installed 12,000 miles of microwave in the past decade and are expected to install an additional 25,000 to 40,000 miles in the next 10 years.

Telemetering didn't create pipeline microwave, but microwave should help and be helped by telemetering. Pipeline operators can whack up initial costs between communications and control.

A system installed in Ohio this year illustrates the kind of set-up coming into favor. Microwave gives an oil company's main station telemetering, remote pumping control, and interstation and mobile communications.

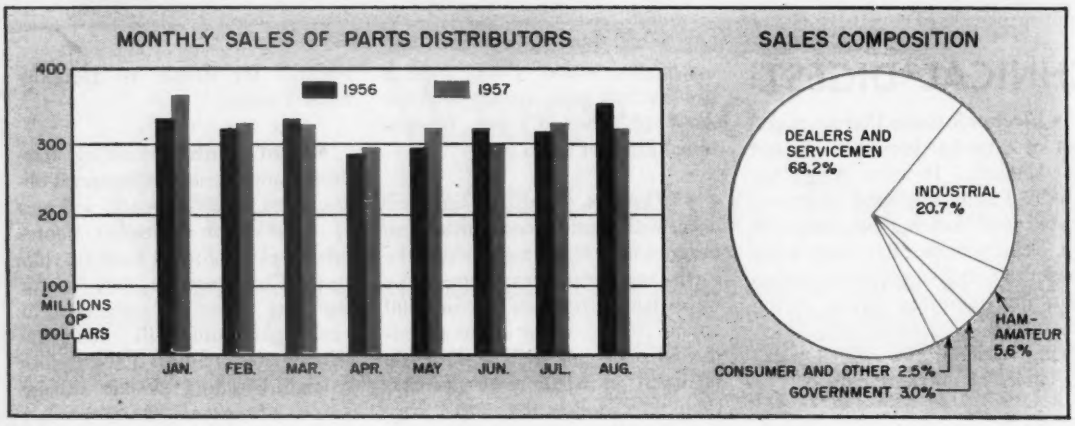
Conservative estimate indicates terminal equipment is selling at around $3 to $4 million a year. It does the actual measuring and recording. Scant on electronics, most of it is sold by old-line industrial control firms.

Transmitting equipment—wire, line carrier or microwave installed for telemetering—accounts for $8 to $9 million a year. The power industry is warming up to microwave, which is less vulnerable to storms and other disturbances.

One manufacturer of load control equipment says annual sales rose from $700,000 in 1947 to $3.2 million in 1956. Electric utilities have taken most of this so far.

Industrial telemetering has been mainly a custom assembly field, but manufacturers are beginning to offer packaged or building-block systems. Two being pushed this year are an electric load and frequency control package and a digital data system suited to a variety of applications.

PRODUCTION and SALES



Parts Distributors' Sales Climb Slightly

PARTS DISTRIBUTORS' 1957 dollar sales are closely paralleling those of last year, according to first eight months' figures released recently by the U. S. Department of Commerce. They reveal a $2 million increase.

Comparison of 1957 monthly sales with the same months of 1956 shows sales been up a little one month and down a little the next. Total sales for the first eight months of this year were $2.549 billion compared with $2.547 billion in the same period last year.

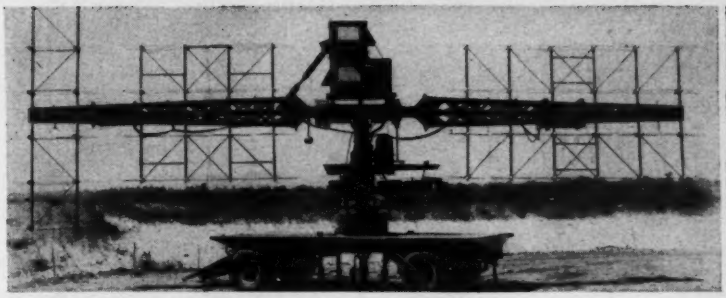
The small increase of $2 million for the 1957 period, less than one-tenth of one percent, is far from cheerful news. Sales for the electronics industry as a whole are estimated to be running eight percent above 1956.

Relative size of sales to dealers and servicemen is declining, although this group continues to account for the bulk of parts distributors' sales. Last year dealers and servicemen were responsible for 68.2 percent of total sales, reports the National Credit Office. However, in 1953 they accounted for 72.1 percent.

On the other hand sales to industrial users have increased. They took 20.7 percent of all sales last year, compared with 16.4 percent in 1953.

The ham-amateur share of the total, 5.6 percent last year, has also increased. Amateurs accounted for 4.9 percent of parts sales through distributors in 1953.

Sales to the government are down slightly—4.1 percent in 1953 to 3.0 percent in 1956.



Radar's lineage was muddled when this set was new . . .

and still is.

Behind the Blair Patent

- **Signal Corps is whooping it up because Patent Office granted rights to ex-signalman William R. Blair**
- **But after all the foofara dies down, the record will be no clearer. Radar industry so far is unconcerned**

DUST is just beginning to clear from the granting of a patent for pulse-echo radar to retired Colonel William R. Blair.

Entire defense establishment gets royalty-free licenses for equipment described in the patent. But it would have these rights regardless of who got the patent rights. Significance to makers of commercial radar is still blurred.

Blair has indicated that his 12-year court battle was to set the record straight. Actually, the Army did the legal work for Blair, who was once chief of the Signal Corps Engineering Labs.

Army Signal Engineering Labs, in an official statement on the patent, calls it "a basic patent for radar," claims "the pulse-echo method of direction-finding and ranging was conceived prior to 1930 by Col. Blair . . ."

Radio reflections from metal objects were observed in 1922. At that time Leo C. Young and A. Hoyt Taylor noticed radio interference when ships passed the Naval Aircraft Radio Labs in Anacostia, D. C. At Young's suggestion, Robert M. Page, now associate director of electronic research at the Naval Research Laboratories, built a pulsed radio system for the Navy. Young and Page were honored last month by Philadelphia's Franklin Institute for having produced "the first pulsed radar system in the U.S."

Getting back to Col. Blair: "By early 1937," the ASEL statement goes on, "a complete workable radar set was demonstrated for the Secretary of War and members of Congress."

Lawrence A. Hyland, now v-p and general manager of Hughes Aircraft, showed Naval Research Labs in 1932 that radio reflections could be used to detect aircraft; IRE gave him its Pioneer Award this year for those demonstrations. Page demonstrated his detection system for NRL in 1934. In England, Sir Robert Watson-Watt detected and located aircraft with his working model in 1936.

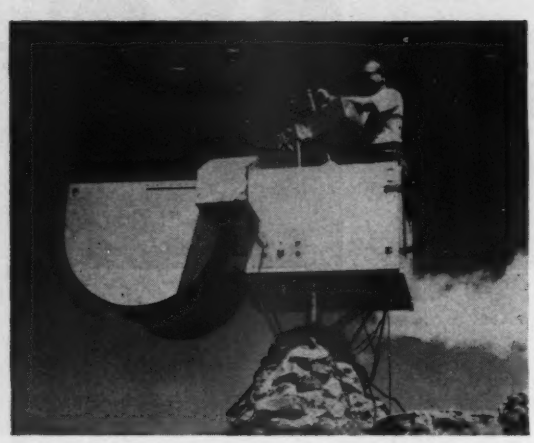
As ASEL pushed the court fights on the Blair claims, Blair [illegible] law to get around normal patent procedure. Security measures kept him from filing within the statutory one year from date of public disclosure. Rep. James C. Auchincloss (R., N. J.) pushed Private Law 1008 through the 81st Congress, which permitted Blair to file.

Auchincloss told ELECTRONICS that he sponsored the bill because people were "ganging up" to keep Blair from his proper due.

"A lot of Auchincloss' bloody sweat," he added, "went into getting the bill through." Compromise was finally worked out by Blair's son, a lawyer.

Signal Corps says the patent means "a tremendous saving to the government on all types of radar now being procured." Manufacturers officially make no comment, privately remark that it means literally nothing. Nobody is charging the government for knowledge embodied in the Blair patent anyway.

Makers of radar for growing commercial markets are studying the patent to see what it means. So far, they figure that by the time the dust settles Blair may have won recognition for a successful research project but little else.



Photoelectric photometer on mountaintop

Navy antenna in Arctic hunts cosmic noise

Electronics' Part in IGY

While Sputnik and Vanguard claim the spotlight, the 5,000 earth-bound scientists cooperating in the International Geophysical Year depend on a $6-million variety of electronic equipment for communications and a picture of what is happening in space, under the earth and sea

SIX WEEKS from today the IGY ends a phase. It'll be one-third finished. As for electronics' $6 million part in the picture—here's a photo report.

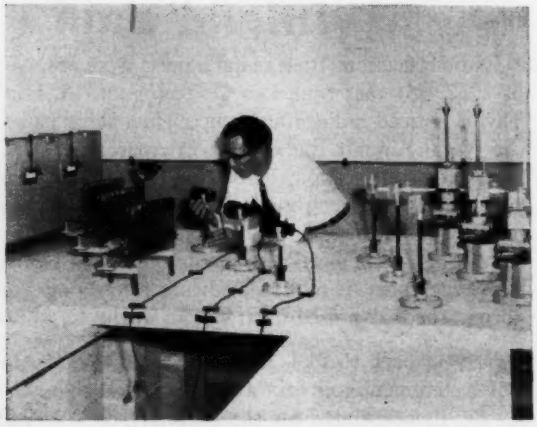
The battle of the satellites has focussed interest in the International Geophysical Year on outer space. But political and military questions raised by Sputnik and Vanguard have nothing to do with the main IGY effort.

There is little drama in the quieter investigations being made by 5,000 scientists of 60 nations—investigations carrying on work begun in the 1882-83 and 1932-33 IPY's (International Polar Years). IGY deals with global geophysics, where IPY's dealt mostly with the Arctic. Electronics is a full-time partner in IGY work, as well as in the satellite projects.

One reason the pattern of holding an IPY or IGY every 50 years was broken is, according to the National Science Foundation, to take advantage of the vast advances in instrumentation during the past 25 years.

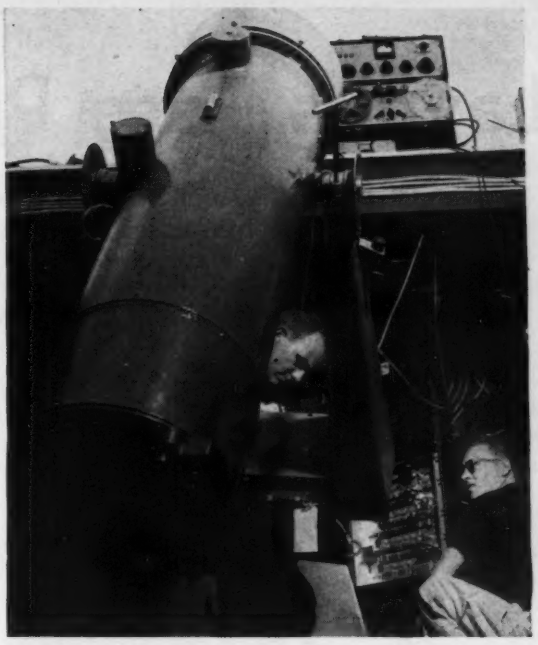
A major achievement of the 1932-33 IPY was discovery of radio blackout in geomagnetic storms. U. S. Coast and Geodetic Survey, continuing these inves-

Woods Hole oceanographers with sonar



Rapid-run magnetometers for magnetic stormcasting

Jesuit seismographer in Antarctica



Satellite station calibration camera

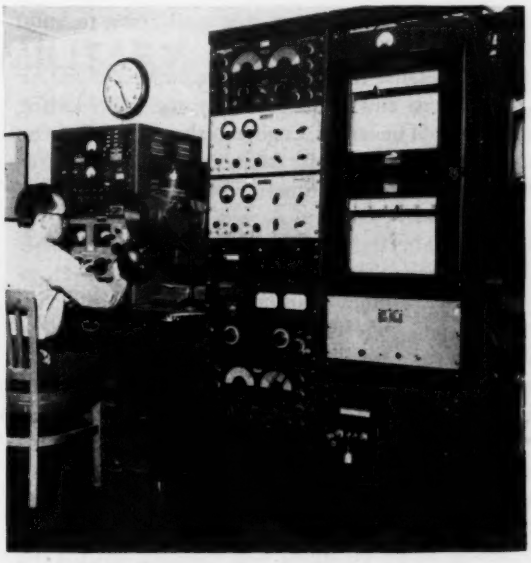
tigations, has equipped 19 observatories. Relationship of magnetic storms, solar flares, sunspots, auroras and radio fadeout are being studied.

The Survey also employs electronics in seismic investigation. About one million earthquakes occur annually, 700 strong enough to be felt or do damage. What causes them, how to predict them, and their relation to weather are vital questions.

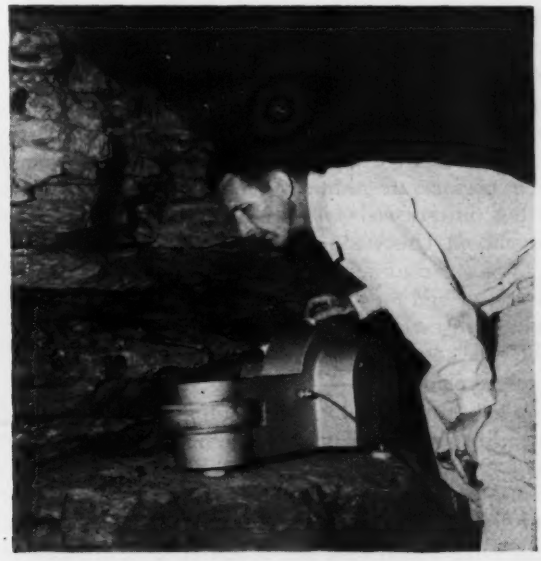
Another of the 46 U.S. investigating agencies is National Bureau of Standards. NBS is concentrating its ground-based activity on the ionosphere. Information obtained, it is hoped, will enable improved prediction of radio propagation conditions, better assignment of radio frequencies for effective communications.

The roster of NBS installations includes 19 ionospheric sounding stations, 18 stations studying reflection of VHF signals, 23 forward scatter stations (including those equipped for use by other nations), three of the 26 world stations investigating the natural radio signals called "whistlers", 13 telescopic photometers.

The chief station in the World Warning Agency, used to alert participants on unusual solar activities or other conditions of interest, is the NBS radio station at Fort Belvoir, Va.



World Warning Agency control room



Seismometer set up in Mammoth Cave

Layoffs Pose Problem

- **But firms meet issue head-on as the employment roller coaster, after riding high, takes a temporary dip**

- **Long Island and Los Angeles areas report most troubles. Here's a look at what's happening around the nation**

No longer rumors and whisperings, the unemployment picture painfully snapped into focus this week. The summary wasn't good: many electronics firms, instead of looking for help, are yelling "Help!"

The budget cuts of last summer's economy-minded Congress have given birth to contract stretchouts, cancellations, a dearth of new contracts and the defense department's new slow-pay policy.

Difficulties created by the current slow-pay policy have been aggravated by much confusion in government circles as to what the policy really is.

According to the latest ukase from Washington, payments to major contractors for the remainder of the year cannot exceed specified amounts no matter how much they produce.

Very recently Secretary McElroy attempted to soften the blow by promising to allow a higher profit when contracts are re-negotiated to compensate for additional financing required. He also said the military will pay its procurement bills according to normal business practice. However, past practice has been payment on delivery while business practice has been to pay in 30 to 60 days.

Faced with such an unhappy situation, this is how electronics firms reacted:

First they have cut down in hiring. As pressures mounted, layoffs followed. Companies have tried to hang on to their engineers, so the first layoffs hit mostly shop employees. Recently, more and more engineers have been let go. Some say many small firms may soon be forced to close shop.

A great many companies have drastically reduced their engineer recruitment programs. Electronics editors interviewed industry members throughout the nation. This was a typical answer:

"We are continuing to hire engineers, but only selectively and for replacements." Selectively meant hiring only men with special abilities and experience. There is very little current demand for the just-average engineer.

A few firms said they were hiring as actively as ever. But these stood out like lighthouses on a lonely shore.

Two areas—Long Island in New York and Los Angeles in California—have been badly hurt.

In Long Island nine out of ten firms have either dismissed employees or are preparing to. Since August more than five percent of the area's 40,000 electronic employees have been given notices. Sperry Gyroscope, largest electronics firm on the island, alone has publicly announced layoffs totalling 950.

In the Los Angeles sector layoffs by aircraft firms, many of whom are heavy in electronics, have been painful. For instance, Lockheed, which had 32,000 employees last August, expects to have only 24,000 by year's end—a loss of 8,000 jobs—and only 17,000 by the end of 1958, a drop of 15,000 jobs—nearly 50 percent—in just 16 months.

Electronics checked other parts of the nation and found:

New England: Layoffs reported by a few firms. Most have been able to shoulder cutbacks and payment lags without layoffs. However, many see a smaller increase in sales and earnings than they had anticipated. Some say their sales and earnings will be less than last year.

Northern New Jersey: This area has suffered much less than nearby Long Island. Of six firms interviewed, only two have had layoffs. Another, is even planning to substantially increase its work force.

Philadelphia-Camden: The two largest firms in the area have laid off three to four percent of their employees. But one of these has not released any engineers. On the contrary, it is continuing to build up its engineering staff.

Chicago: Smaller companies in the area have laid off some workers. But the larger companies deny letting people go. The area's engineer shortage has been eased somewhat because of recent cutbacks. Yet there's still a shortage of men with specific knowledge in development work.

Michigan: The state unemployment commission reports no change in electronics employment. However, the electronics division of one auto industry firm has laid off 300 production workers due to stretchout on a missile guidance program.

Dallas-Fort Worth: No layoffs reported. Many firms still have jobs open for engineers. Even so, the engineering market appears to be looser with a big increase in the number of applicants.

San Francisco: Stretchouts have led to a few layoffs. But most firms have been able to meet the situation by cutting down on hiring and building against inventory.

USAF Buys More Missiles

AMC chief urges aircraft industry to establish missile capabilities. More missiles mean more electronics

THIS WEEK the word was rumbling through the aircraft industry grapevine: "Become capable in missiles—and fast."

Reasons were obvious: Manned aircraft procurement will plummet from $4 billion this year to a little less than $2 billion in fiscal 1958—this means electronics for aircraft will drop from $1 billion to less than $½ billion.

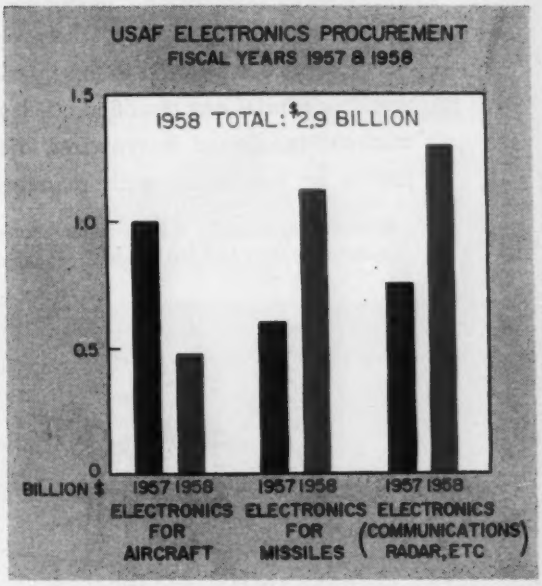
Missile procurement will zoom skyward from $1.5 billion to $2.8 billion—electronics portion amounts to a rise from $0.6 billion to $1.12 billion.

USAF purchase of communications, radar and other electronic gear—a large portion of which will go to support the ballistic missile program—will almost double, going from $¾ billion in 1957 to $1.3 billion in 1958.

Total USAF procurement of electronics for 1958 adds up to about $2.9 billion.

In view of this obvious change in direction, USAF urged "airframe and related industry firms to establish capabilities in the missile area as rapidly as possible and to work closely with the current prime in our program to achieve an overall weapon system integration."

Spokesman was Gen. Ben I. Funk, Deputy Director for Ballistic Missiles and Ballistic Missile Manager for the Air Materiel Command. He talked to the West Coast Electronics Manufacturers Assoc. last month.



In stressing the importance of electronics in the shift to missiles, Funk pointed out that all 16 major primes who develop and produce systems and subsystems for ballistic missiles are heavy users of electronic equipment. One nose cone contractor has expended some $8 million in electronic systems and components.

MILITARY ELECTRONICS

• **Nike-Zeus** anti-missile missile project (ELECTRONICS, Oct. 20) gets $5,086,481 boost by Army contract to Western Electric.

• **Nike-Hercules** is four times bigger and will cost four times as much as Nike-Ajax which it will soon replace.

• **Polaris** gets 62.1 million Navy contract lift, the contract going to Lockheed. Westinghouse already has $10 million to develop launching equipment; GE has $1½ million for guidance; and Sperry is prime contractor for inertial launching vessel system now on USS Compass Island.

• **Major Alexander Seversky** warned an Armed Forces Communications and Electronics Association meeting in New York that to cope with the Soviet Union the DOD must:

1) Increase production of long-range bombers to 40 per month. (We are now producing nine a month while Russia turns out one Bison a day.)

2) Develop an anti-missile missile that attacks "by means of collision."

3) Bring our missile production up to parity with the USSR.

4) Strengthen Continental Air Defense by expanding communications, electronics and missiles.

CONTRACTS AWARDED

Electronic Communications gets $7 million contract with Hughes for airborne communications and data-link equipment to be used in Hughes' automatic, electronic fire-control systems in F-102 and F-106 interceptor aircraft. This contract supplements last year's $5-million award for similar equipment.

Cubic Corp. gets a $1,100,000-contract extension for production of Secor units used by USAF in tracking missile and rocket flights.

Topp Manufacturing wins $1,099,-729 contract with CAA for 65 vhf

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omnidirectional radio ranges (VOR) and related equipment.

AC Spark Plug gets $1,753,399 contract with Warner Robins Air Materiel Area for modification kits applicable to ME-5 BNC systems.

Aerophysics Development is awarded $403,036 contract with Army Ordnance District, Los Angeles, for Dart antitank guided missiles. Guidance is visual/electrical.

RCA wins AMC contract amounting to $5,282,598 for AN/ARC-21 hf radio sets consisting of component parts for the B-52, B-66, B-47 and KC-135.

McDonnell Aircraft will conduct a study for AMC to integrate the F-101B weapon system with CONAD's warning system under $267,231 contract.

Sperry gets two contracts with AMC totaling $330,000 for repair of test equipment for MA series fire-control systems, A-series gun-bomb rocket sights and K-series bombing navigational systems.

Federal Telecommunications Lab wins $650,327 AMC contract for five flying, service test models of radio sets AN/ALQ-10.

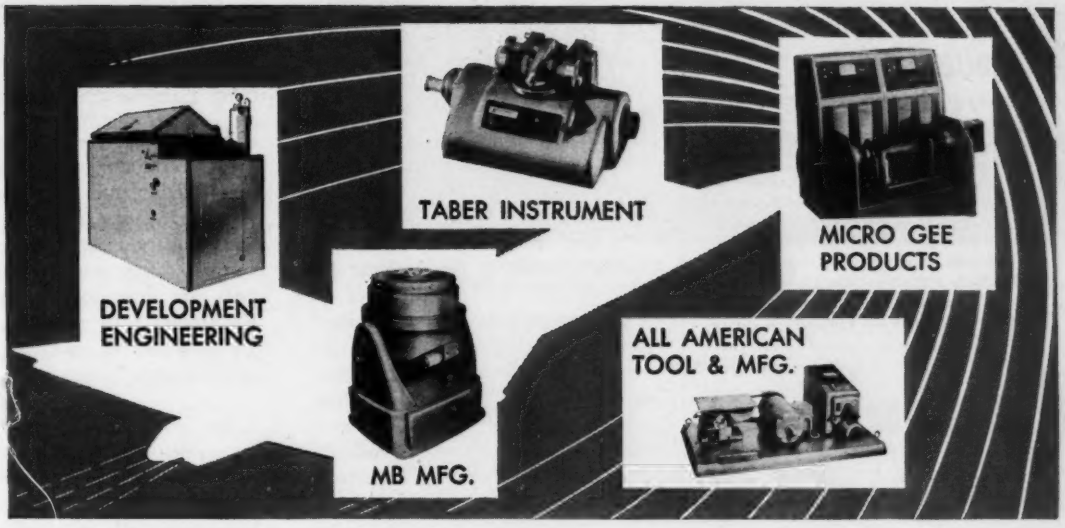
Bermite Powder Co. sells flash signals and adapters for telemetering pack and flash signals for exercise head for Sparrow III to BuOrd.

GE sells to Rome Air Force Depot a reproduction model of modification equipment for radar-course directing group, AN/GPA-37, for $539,965.

GE will provide engineering services in connection with installation, test, repair and servicing of fire-control systems and power drives to BuOrd under $302,000 contract.

Ford Instrument gets a BuOrd contract for engineering services in connection with maintenance repair personnel training, checkout of the MK-47 computer and other fire-control equipment.

Testers Meet New Specs



Offer Tighter Control

BETTER control, increased ranges and new standards are available to simulate conditions in which electronic gear must perform. Vibration machines are announced by **All American Tool & Mfg.** (41) that provide any frequency between 5 and 100 cps and sweep up and down between any two frequencies within that range. A two-degree-of-freedom simulation table is offered by **Micro Gee Products** (42) for statically and dynamically testing gyros and accelerometers.

An instrument for establishing a standard test of wire insulation resistance to abrasion is made public by **Taber Instrument** (43). Redesigned salt spray fog test chambers are offered by **Development Engineering** (44) in sizes from 2 to 10 feet cube. Vibration exciters announced by **MB Mfg.** (45) deliver forces up to 1,750 lbs and have a frequency range from 5 to 5,000 cps.

A 14-stage electron multiplier is offered by **National** (46) for the detection of charged particles such as electrons and positive and negative ions. . . . **National Vulcanized Fiber** (47) announces a glass-base, silicone resin laminate especially designed for high-temperature electronic applications. . . . Tube savers are available from **RCA** (48) to reduce burn-in of image-orthicon pickup tubes in both black-white and color tv cameras.

Miniature aluminum electrolytic capacitors offered by **Magnavox** (49) have ratings ranging from one to 125 microfarads and 4 to 150 volts d-c. . . . Rapid digital readout and paper tape records of 1,000 resistances, a-c or d-c voltages are made by a system announced by **Non-Linear Systems** (50) for evaluating electronic components.

Raytheon (51) announces four all-welded, hermetically sealed, high-temperature silicon diodes, the 1N253, 1N254, 1N255 and 1N256. . . . A null meter announced by **Trio Labs** (52) has the lower half of the scale expanded to cover zero to 60 mv to facilitate null adjustments of resolvers, synchros and potentiometers. . . . Rosette foil-type strain gages announced by **Baldwin-Lima Hamilton** (53) are said to have higher sensitivity and stability.

Ferrite load isolators offered by **Litton Industries** (54) are 1 inch long, weigh 9 ounces and provide better than 10 db isolation over the frequencies from 8,500 to 9,600 mc. . . . Precious and rare metals and their alloys are used for making a line of solid and clad contacts by **Contacts Incorporated** (55).

Transformers now being produced by **Triad Transformer** (56) are said to exceed the requirements of MIL-T-27A, class S. . . . Mach and true air speed meters announced by **M. Ten Bosch** (57) include a model covering speeds from 100 to 1,000 knots with an accuracy of $\pm\frac{1}{4}$ knot. . . . Conversion of shaft rotations into discreed decimal digits for punched tape or printer systems is accomplished by a digital converter available from **Taller & Cooper** (58).

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A light-weight 200-watt p-m transmitter is announced by **Texas Instruments** (59) for use in f-m/f-m telemetering. . . . Semiconductor d-c to d-c converters offered by **Kepco Labs** (60) deliver 325 volts from sources of 6, 12 and 28 volts. . . . Sensitivity of 10 microvolts is provided by a phase-angle voltmeter developed by **North Atlantic Industries** (61) for use as a null indicator, ratiometer and detector for synchro bridges.

A new line of radio communication systems is being made by **GE** (62) for use on all types of vessels to provide bridge-to-bridge and bridge-to-shore communications. . . . British made multimeters marketed by **British Industries** (63) feature hand calibration of each meter against standards and accuracy better than 2 percent of top half of scale and one percent of full-scale for deflections below half scale.

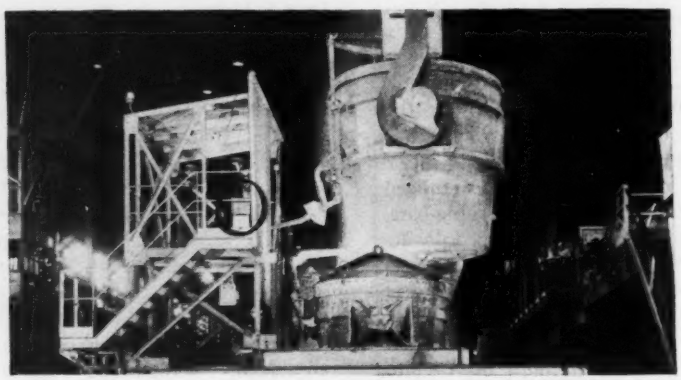
Tung-Sol Electric (64) adds a selection of neon glow lamps including types NE-2 and NE-51. . . . A vidicon television camera chain has been designed by **DuMont** (65) with subminiature components in accordance with military specifications.

Five-inch screens are used on general purpose oscilloscopes announced by **Simpson Electric** (66) that are 8 by 12¼ by 16½ inches. . . . Thrusts, impacts and vibrations from 1.5 to more than 10 g's actuate inertia switches announced by **Minneapolis-Honeywell** (67). . . . Small phototube and light source heads are available from **Autotron** (68) for mounting in limited or hard-to-get-at spaces.

Limit stops with ranges from zero to 10 and zero to 40 turns are available from **Precision Mechanisms** (69) as standard components for use in servo systems. . . . Both positive and negative outputs are provided by **American Electronics'** (70) scintillation counter so it can be used with either a spectrometer, scaler or ratemeter.

An instrument incorporating a d-c millivoltmeter and d-c amplifier announced by **Industrial Control** (71) features zero center scale indication with ±1 millivolt full scale and an amplifier gain of 1,000. . . . Tunable X-band magnetrons announced by **Bomac Labs** (72) are capable of 300 kv peak output. . . . Clutches for electromechanical systems have been developed by **Sterling Precision Corp.** (73) that permit engagement or disengagement of either or both output shafts from a single input shaft.

Output frequencies of 1,200 or 2,400 cps are provided by a light-weight transistorized frequency



Fill 'er Up With ITV

Closed circuit tv system (circled) is used by U. S. Steel to watch ladle stream into giant vacuum casting chamber. Tv allows operators to see when chamber is full. Ingots weighing 180 tons are cast.

converter developed by **Robertshaw-Fulton Controls** (74) for magnetic amplifiers in autopilots, guidance systems and telemetering gear. . . . **Zeus Engineering** (75) is selling a transistor index made up of punch-coded cards that contain pertinent transistor data to enable engineers to select quickly units with suitable characteristics for a particular application.

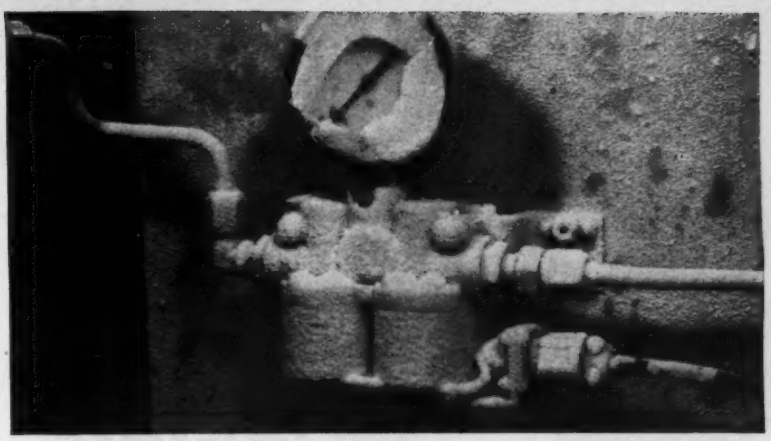
Five-cell mercury battery holders available from **Cambridge Thermionic** (76) are said to hold batteries securely when fastened to chassis or printed-circuit boards, even under severe conditions of vibration and shock. . . . **Kaar Engineering** (77) is marketing a radiotelephone that permits officers to communicate directly to bridges of nearby ships.

Frequency calibrators are announced by **Fenske, Federick & Miller** (78) to calibrate oscillators and discriminators in f-m/f-m telemetering systems. . . . Called the Secode, a device offered by **Electrical Communications** (79) enables mobile radio operators to dial another selected station in the system without alerting other listeners.

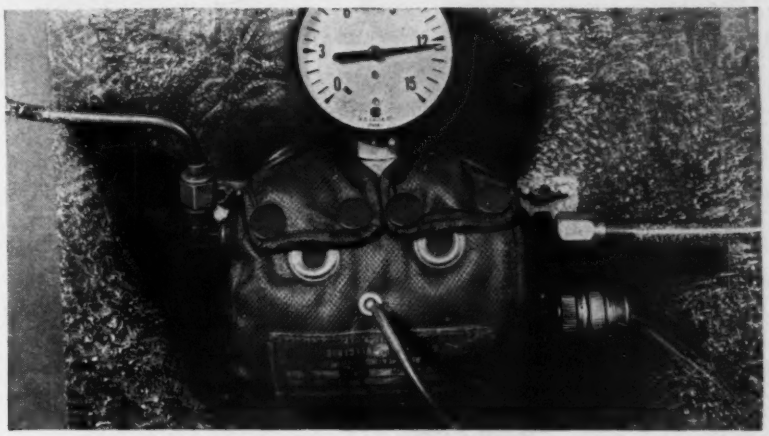
A wire stripper offered by **Manger Electric** (80) strips ends and at desired intervals throughout the length of the wire, permitting a single wire to be used to connect more than two terminals. . . . Synchros in size 23 frames have been announced by **Norden-Ketay** (81) that combine the functions of torque receiver, control transmitter and torque transmitter.

Oscilloscopes announced by **Tektronix** (82) have identical horizontal and vertical characteristics for high-frequency X-Y type operation but can be converted for normal use by plugging in a time-base generator in the horizontal amplifier. . . . A servo repeater system available from **Waldorf Instrument** (83) includes a transistorized servo amplifier, motor, synchro, power supply and gear train in a housing 2 inches in diameter and 4 inches long.

Side indicator panel meters de-



FREEZE-UP of solenoid-controlled valve in airborne system at −65°F can choke off vital air supply. Manufacturer faces tight contract delivery schedule.



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veloped by **International Instruments** (84) to save panel space may be mounted horizontally or vertically to replace conventional round or square meters. . . . An events recorder announced by **Brush Instruments** (85) handles up to 100 channels of on-off information for checking sequences in missile and aircraft control systems, and checking relay chatter and contact bounce.

Called the Gammascan, a scintillation-detecting type instrument has been developed by **The Budd Co.** (86) to measure and record thicknesses and densities of such continuously produced materials as metal, glass, plastics. . . . Overall accuracy of 0.1 percent over the range from 0.1 to 50 g's is claimed for a servoed-type pendulous accelerometer by **Physical Measurements** (87).

New Product Makers

41: All American Tool & Mfg., 8025 Lawndale Ave., Skokie, Ill.
42: Micro Gee Products, P. O. Box 1005, Culver City, Calif.
43: Tabor Instrument, N. Tonawanda, N. Y.
44: Development Engineering, 9 Cross St., Norwalk, Conn.
45: MB Mfg., P. O. Box 1825, New Haven 8, Conn.
46: National Co., 61 Sherman St., Malden 48, Mass.
47: National Vulcanized Fibre, 1057 Beech St., Wilmington 99, Del.
48: RCA, 30 Rockefeller Plaza, New York 20, N. Y.
49: Magnavox, Fort Wayne 4, Ind.
50: Non-Linear Systems, Del Mar, Calif.
51: Raytheon, 55 Chapel St., Newton 58, Mass.
52: Trio Labs, 4025 Merrick Rd., Seaford, N. Y.
53: Baldwin-Lima-Hamilton, Waltham 54, Mass.
54: Litton Industries, 215 S. Fulton Ave., Mount Vernon, N. Y.
55: Contacts Incorporated, Wethersfield, Conn.
56: Triad Transformer, 4055 Redwood Ave., Venice, Calif.
57: M. Ten Bosch, Pleasantville, N. Y.
58: Taller & Cooper, 75 Front St., Brooklyn 1, N. Y.
59: Texas Instruments, 6000 Lemmon Ave., Dallas 9, Tex.
60: Kepco Labs, 131-38 Sanford Ave., Flushing 55, N. Y.
61: North Atlantic Industries, 603 Main St., Westbury, N. Y.
62: GE Communications Equipment, Electronics Park, Syracuse, N. Y.
63: British Industries, 80 Shore Rd., Port Washington, N. Y.
64: Tung-Sol Electric, 95 8 Ave., Newark 4, N. J.
65: DuMont, 750 Bloomfield Ave., Clifton, N. J.
66: Simpson Electric, 5200-18 W. Kinzie St., Chicago 44, Ill.
67: Minneapolis-Honeywell, Freeport, Ill.
68: Autotron, P. O. Box 722-H, Danville, Ill.
69: Precision Mechanisms, 577 Newbridge Ave., East Meadow, N. Y.
70: American Electronics, 655 W. Washington Blvd., Los Angeles 15, Calif.
71: Industrial Control, 805 Albin Ave., Lindenhurst, N. Y.
72: Bomac Labs, Salem Rd., Beverly, Mass.
73: Sterling Precision Corp., 34-17 Lawrence St., Flushing 54, N. Y.
74: Robertshaw-Fulton Controls, 401 N. Manchester, Anaheim, Calif.
75: Zeus Engineering, 635 S. Kenmore Ave., Los Angeles 6, Calif.
76: Cambridge Thermionic, 445 Concord Ave., Cambridge 45, Mass.
77: Kaar Engineering, Middlefield Rd., Palo Alto, Calif.
78: Fenske, Federick & Miller, 12820 Panama St., Los Angeles 66, Calif.
79: Electrical Communications, 765 Clementina St., San Francisco, Calif.
80: Manger Electric, Miller St., Stamford, Conn.
81: Norden-Ketay, 58 Commerce Rd., Stamford, Conn.
82: Tektronix, P. O. Box 831, Portland 7, Ore.
83: Waldorf Instrument, Wolf Hill Rd., Huntington Station, N. Y.
84: International Instruments, P. O. Box 2954, New Haven 15, Conn.
85: Brush Instruments, 3405 Perkins Ave., Cleveland 14, Ohio
86: The Budd Co., 2450 Hunting Park Ave., Philadelphia 32, Pa.
87: Physical Measurements, 1650 19 St., Santa Monica, Calif.

Tv Nets Swing to Tape

Thirteen television magnetic tape recorders are in use, 100 more are on order

As to what is now being done right now with taped tv, here's what the networks and other sources told ELECTRONICS last week:

Prototype Ampex units (black and white) have been in use for over six months. Networks are using 13. The U. S. government has two. Ampex has an order backlog for 100 production units.

A color videotape record-player—brought out by RCA only a few weeks ago—will be available for network use early next year. Production models for stations are planned for delivery late next year.

The Ampex unit is selling for $45,000. Price on the RCA model is estimated at "under $100,000."

A roundup of networks (using Ampex models) shows:

ABC's three machines are in Chicago, recording an average of 23 hours weekly for playback to stations in western time zones.

In two instances, shows have been pre-programmed on tape to allow a star's being absent at normal program time.

On a year-round basis John Daly's news program is produced in New York, recorded in Chicago, and played back to the entire network at a later hour.

As for the Ampex recorder's performance, this network reports three minutes programming lost out of 350 hours recording over a six-month period.

ABC has six more recorders on order, plans to place two of the new ones at network headquarters in New York.

NBC has five Ampex units, all located in Hollywood. These record 30 hours of programming weekly for playback to western time zones. This network has more Ampex units on order. Some are for New York, others for the West Coast.

CBS has five units—all in Hollywood—which record 30 hours programming per week for playback to western time-lag areas.

It has further units on order for use in New York, but plans no taping facilities for intermediate use between New York and the West Coast.

FCC ACTIONS

• **Denies** a petition by Joseph Brenner asking that television stations be allowed to broadcast music and other sound-only programs while showing slides during part of the broadcast day. The Commission ruled that aural and visual transmission must both be integral parts of the programming.

• **Removes** educational reservation from channel 9 in Eugene, Oregon, making it available for commercial use there.

• **Grants** to Allied, Inc., Rahway, N. J., permission to operate one base station and ten mobile units in Special Industrial Radio Service. The Commission, in this case, waived section 11.504 of the rules to permit location of the base station in a metropolitan area.

• **Amends** tv assignments table, giving channel 9 to Wausau, Wisc., and substituting channel 8 for channel 9 in Iron Mountain, Mich.

• **Rules** that applications for remote control of broadcast radio transmitters with directional antennas will be considered on a case-by-case basis. Each station must show that the directional antenna system is stable and in proper adjustment.

• **Withdraws** a Commission motion which proposed that tv broadcast stations be allocated on the basis of individual applications. The Commission felt it would be "inappropriate" to adopt such measures before the Television Allocations Study Organization completes its study of the allocations structure.

• **Dismisses** protest of Broadcast House, and Radio St. Louis, directed against the Commission's July 18 grant allowing CBS to change station KMOX-TV's proposed transmitter site and increase the proposed height of the station's antenna tower.

STATION MOVES and PLANS

WAGM, WAGM-TV, sold to Northeastern Broadcasting by H. D. Glidden for $525,000.

KHUM-TV, Eureka, Calif., switches signal from channel 13 to channel 6, increases antenna height from minus 70 to plus 460 feet.

WGFS, Covington, Ga., moves studio and antenna-transmitter locations, makes changes in antenna and ground systems.

KYW-FM, Cleveland, Ohio, plans to move transmitter to Parma, Ohio and make changes in antenna system.

WPRW, Manassas, Va., alters construction plans, changing antenna-transmitter and studio locations, and decreasing antenna height.

KS2XBR, Chicago, Ill., (Zenith Radio Corp.), changes frequency of

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experimental tv station from 512-518 mc to 614-620 mc.

WCKR-FM, Miami, Fla., leaves the air for six months to locate and purchase new transmitter site.

WTJS, Jackson, Tenn., increases daytime power from 1 to 5 kw.

WBEV, Beaver Dam, Wisc., plans to operate transmitter by remote control.

KGU, Honolulu, Hawaii installs new transmitter, increases power, and plans to operate transmitter by remote control.

KAPK, Minden, La., increases power from 100 to 250 watts.

WMUB, Oxford, Ohio, plans to move transmitter and studio location, and make changes in transmitter system.

KGRN, Grinnell, Iowa, changes transmitter location, increases antenna height.

KPAL, Palm Springs, Calif., positive control passes to Harry Maizlish through stock purchase.

KLFT, Golden Meadow, La., plans to install new transmitter, increase power, and operate transmitter by remote control.

KLYN, Amarillo, Texas, license passes to Nichols-Whitney Broadcasters, for $76,000.

WACL, Waycross, Ga., plans to install a new transmitter, increase daytime power.

KTSM and KROD, El Paso, Texas, are combining their facilities Sunday afternoons to give listeners a program of a stereophonic music. Listeners tune in a set to each of the a-m stations.

KART, Jerome, Idaho, positive control gained by Herbert E. Everitt through stock purchase.

KDFW, Cedar Hill, Texas, reduces erp to 25 kw because of difficulty with equipment.

Long Island Feels Pinch

Defense stretchouts cause some layoffs. Governor seeks missile work, payment speedups as diversification program gets underway

DEFENSE contract stretchouts pinched Long Island electronics companies harder than ever last month. In the first two weeks of October nine large electronics firms dropped 1,169 people from their payrolls.

More layoffs are in the cards for the next six months. But the second quarter of 1958 may see a rebound in both contracts and employment if industry and state plans succeed.

Most layoffs in electronics are called "moderate." However, some firms, including small ones that are having trouble meeting their payrolls, fear the possibility of heavy layoffs in the next few months.

An estimated 40,000 persons in Long Island's Nassau and Suffolk counties work in electronics. Industry is about 70 percent defense contract work.

Edward T. Dickinson, New York State Commissioner of Commerce, told ELECTRONICS that the state was "trying to get a reversal of the stretchouts" because of the particular severity with which recent defense economy moves have struck Long Island plants.

Governor Averill Harriman has been discussing the situation with Defense Secretary McElroy. He is reportedly seeking new missile contracts for the affected plants as well as speeded up payments on contracts that have been stretched out. New York's Senators Javits and Ives are also said to be putting pressure on the administration to ease the burden of cutbacks on Long Island.

Here's how the employment situation shapes up in ten of the largest electronics firms on Long Island cutting across four industries: March total was 29,500; June —29,100; September—28,700.

In the first two weeks of October, with nine of the ten firms in the sampling reporting figures to the New York State Department of Labor, the total dropped to 27,531. Three firms reported dropping 140 more employees the next week. Indications are strong that the employment decline will continue for some time.

Sperry Gyroscope, for example, plans to lay off 300 people between November 1 and the end of the year, then drop another 300 in the first three months of 1958. A spokesman, however, says Sperry is "generally optimistic" and expects new programs to take up the slack by the second quarter. By the end of 1958, he says, Sperry hopes to have all of its 17,400 employees back on the job.

Meanwhile, five men from the Commerce Commissioner Dickinson's office have been traveling around the U. S. trying to sell Long Island to electronics and other firms that are ripe for representation in the New York area. Controls and instrument makers are among the types of companies that are being sought to increase diversification in Long Island industry and take advantage of the skilled labor pool. State plant site surveyors have been at work on Long Island since mid-October. By early November they had covered 50 sites in five townships.

Two weeks ago Dickinson announced that Muirhead & Co., of Britain and Canada, would build a plant in Huntington, L. I. to employ 150 technicians. The firm, which employs 1,250 persons in its Beckenham, England plant, makes electronic measuring instruments.

Layoffs so far have not been reflected in unemployment insurance claims, indicating perhaps that many of the persons affected hope to find new jobs quickly. Engineers and scientists have apparently not been seriously affected. However, there are signs of some nervousness among these people.

Conference (l. to r.) Holaday, Mahon and Schriever talk it up. Subject: money for missiles

Congressmen Plan Missile Report

WEST COAST ballistic missile efforts this month came under the close scrutiny of a congressional subcommittee on defense appropriations, with an official report to Defense Secretary McElroy expected as this issue of ELECTRONICS reaches its readers.

A five-man team of congressmen spent three days inspecting missile facilities and meeting with Air Force and industry officials. Chairman George H. Mahon (D., Tex.) told a press conference there are no limits on funds for ballistic missiles, that "the sky's the limit."

The group visited Air Force Ballistic Missile Division Headquarters in Inglewood, where there were talks with Maj. Gen. B. A. Schriever and his staff; Convair's San Diego production and test facilities for the Atlas; Aerojet-General Liquid Engine manufacturing and test areas, and Douglas Aircraft's Thor site in Sacramento.

Besides chairman Mahon, the group consists of George Andrews (D., Ala.), Richard B. Wigglesworth (R., Mass.), Everett P. Scrivner (R., Kans.), Harold Ostertag (R., N. Y.), and William M. Holaday, special assistant to the Secretary of Defense for guided missiles.

Mahon said it would "take several years before the Russians, or we for that matter, will have a stockpile of operational missiles." Asked about the U. S. anti-ICBM program, Mahon said this was "in the very early stages.

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Cube-Oriented Steel

New silicon-iron magnetic steel may reduce weight and hysteresis in cores. It might also simplify manufacturing

CUBE-ORIENTED magnetic steel is now in pilot-plant production. It is expected to find its first applications shortly in airborne transformers, relays and other electronic components.

Westinghouse has carried process development to the production of thin strips and is making thick gages under laboratory conditions. The metallurgical processes involved were worked out last year by Vacuumschmelze division of Siemens-Halske, of Germany.

Known as Cubex, it is three-percent silicon-iron steel which has cubic crystals. Its crystals line up like ice cubes in a refrigerator tray. Since magnetic flux travels easily along cube edges, the new steel permits flux across the width of the strip as well as along the length.

Grain-oriented silicon-steel used for 25 years as a core material lines up the cubes on one edge. Resistance to flux diagonally through the crystals limits flux to the direction along the length of the strip.

Tests comparing the magnetic efficiency of the two types of silicon-steel show the new steel has greater magnetic strength, less resistance to alternating flux and lower hysteresis loss. One-half oersted coercive magnetic force will produce a 2,500-gauss induction in grain-oriented steel and almost 10,000 gauss in cube-oriented steel while loss at 60 cycles and 13,000 gauss is cut, 0.7 to 0.5 watt.

The new steel can also result in simplified production techniques. Cores of grain-oriented silicon-steel are commonly made in two or more parts to allow flux to follow the grain. Cube orientation allows one-piece construction since the lines of force can turn corners within the same piece of steel.

Small Brains Big at Show

INCREASING popularity of small-size computers, already noticeable at last year's National Business Show, was accentuated at the 1957 show.

Several new manufacturers showed computers in the small-size or less than $100,000 bracket. In most cases the prices were in the $25,000-$50,000 category.

Monroe Calculating, exhibitor of the less-than-$10,000 Monrobot IX, is aiming for the average size business. It claims its desk-size computer can be programmed for any business application.

Other desk-size computers seen at the show were the IBM 610, Royal Precision's LGP-30, Burrough's Electrodata 101 and Underwood's business computer.

Not exhibited at the show, but promoted by Clary in connection with its Transactor for department store use, was Bendix' low cost computer, the Bendix G-15. National Cash Register which also exhibited its Sales-Tronic point of sale recorder, did not exhibit a companion computer. But, ELECTRONICS was told that NCR will introduce a small-size computer for use with Sales-Tronic.

Planning Ahead Soviet-Style

Russians use scientific methods and state control to introduce technical innovations

SIGNS NOW indicate Russia is launching an electronics offensive—a drive they may give our industry many more scientific implications to think about than Sputniks beeps.

Scientific methods and centralized administrative authority are being applied by the Soviet Union to large-scale introduction of technical innovations in electronics.

An editorial in Russia's *Industrial Economics Gazette* a while ago scolded the Ministry of Communications and the Ministry of the Radio Industry for "inadequate attention" to the "wide-scale introduction of technical innovations whose design has already been worked out."

The USSR State Planning Commission was urged to take "urgent steps to restify this by planning for the necessary scale of production and introduction of new techniques."

It appears that the Russians are now at a level of basic technical proficiency that justifies an even greater totalitarian mobilization of their scientific development and production resources.

An article in *Vestnik Svyazi* discusses "a system of economic-engineering indices necessary for the evaluation of the economic effectiveness of the new communications technology." This article also covers "the calculation methods and the conditions necessary for the application of these indices during the planning and introduction of new engineering measures."

There is evidence the Russians are pressing hard studies and experimental work in important areas of electronics, particularly communications. For example, tropospheric scatter transmission, a reality in our northern Canada radar line and now in use commercially in several parts of the world, is regarded in the USSR as the "new trend in development of radio communications."

The Russians see effective use of tropo over distances of more than 200 km and claimed last spring that they were building experimental lines.

DEVELOPMENTS ABROAD

• **In Paris** the International Federation of Automatic Control was recently founded to promote development of the theory and practice of automatic control, including data handling and computers. IFAC will hold international conventions and carry out studies in special committees. First convention is tentatively scheduled for 1959 or 1960 in Moscow.

• **U.S.** IGY Committee spokesman told ELECTRONICS last week that, contrary to Egypt's contention, there had never been a decision to place satellite tracking and recording equipment in Aswan. Egypt had missed Sputnik and charged the U. S. "refused to supply Egypt the necessary equipment."

A U. S. spokesman said Egypt was one of many countries that received unofficial overtures in 1956 from individual scientists working on the selection of the sites for the 12 IGY stations. An IGY technical panel decided where the U. S.-equipped stations would be located, based on technical considerations.

But in peepless, beepless Egypt, coincident with the charge against the U. S., a Soviet geophysical mission went about setting up an observation post and announced that the Russian gear would be donated to Egypt's Helwan Observatory.

• **Two Russian** metallurgical journals will be published in English beginning in January 1958 under terms of a contract signed by Acta Metallurgica and the Pergamon Institute. The National Science Foundation is helping to defray the cost by a $23,710 grant to Acta Metallurgica.

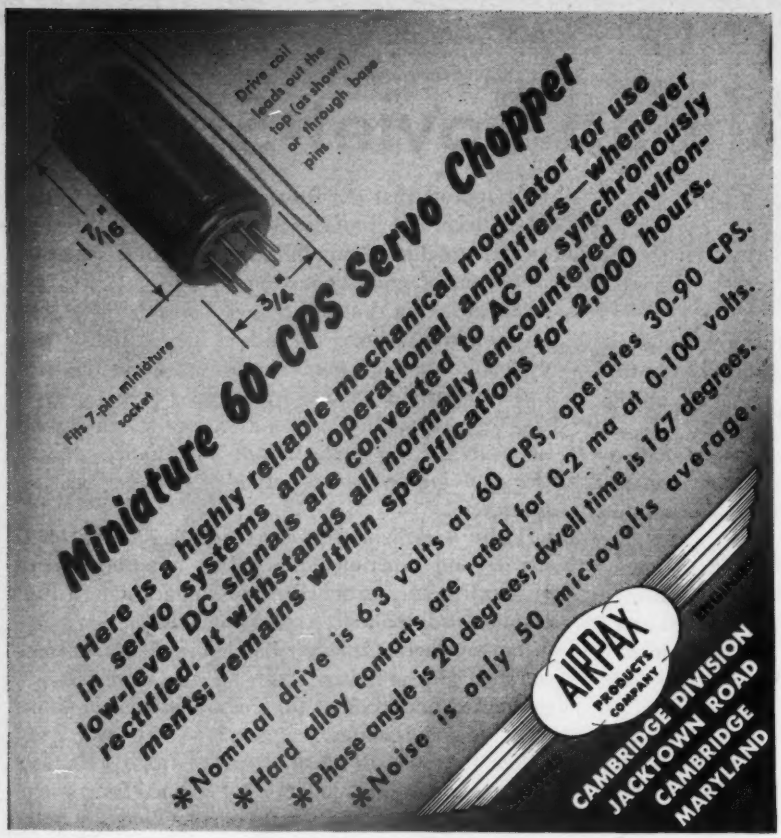
• **British** data processing engineers, working closely with the British Standards Institution, are aiming to simplify computer equipment through standardization. They are working in committees as members of the Data Processing Section of the Radio Communication and Electronic Engineering Association.

EXPORTS and IMPORTS

In Fuerth, Bavaria, skyrocketing Grundig Radiowerke GmbH expects sales of $95 million this year, compared to $53 million last year and $39 million in 1955. Last year the firm exported 44 percent of its manufactured units and accounted for 30 percent of West Germany's electrical exports. Report commemorated the 10th anniversary of the firm's start in a barrack with fewer than 100 employees. Eight plants now employ 20,000.

In Amsterdam a new subsidiary of Tracerlab will direct all West European and Mediterranean business for the Waltham, Mass. firm. Production is expected to start shortly in Holland. The firm makes and sells x-ray gear and equipment for detecting and measuring radioactivity.

In Malden, Mass. National Company announced award of a $600,000 contract from RCA for produc-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tion of ionospheric scatter receivers and excitation equipment for the multimillion dollar defense network between Hawaii and Japan.

Australian demand for television is soaring. Tv manufacturing, barely more than a year old, has achieved an annual production rate of 275,000 sets and expects to reach 325,000 by early 1958. With plans underway to extend tv service from Melbourne and Sydney, the demand for sets is expected to rise sharply in Australia's other big cities. Annual production rate may hit 400,000 by mid-1958, but imports of station equipment and parts will probably increase greatly too.

French giant CSF will absorb Sadir-Carpentier, one of the big ten in French electronics with 1956 gross sales of almost $9 million, if stockholders approve. CSF will gain two well-equipped new plants in the Paris area. Sadir-Carpentier manufactures measuring instruments, navigational aids, telecommunication systems and radar.

Venezuela's Maracaibo area, already one of the world's greatest concentrations of h-f communications systems, is getting South America's first forward scatter system. Collins Radio is installing the system for Cia. Shell de Venezuela, a 115-mi link between the company's Cardon refinery and Maracaibo headquarters. Following recent oil concessions, installation of communications equipment in the area has been running at a better than $2 million annual rate. The Venezuelan government is currently studying U.S. and European bids on a $15 million nationwide telecommunications network.

In the western Venezuelan city of Barquisimeto RCA de Venezuela is installing $600,000 worth of equipment for a radio station. Gear includes two 15,000-watt transmitters for 60-meter and 31-meter bands, with two towers for each unit. A third 15,000-watt transmitter is for low-frequency broadcasts, together with a 250-watt transmitter for f-m at 98.5 mc. This will use a 440-ft tower designed for 50,000-watt output.

Burroughs Decentralizes

Now MAKING a bid for a major share of the computer market, Burroughs Corporation is also taking steps down the path of decentralization. Factories, labs and sales divisions from Paoli, Pa., to Santa Monica, Calif., will be cut loose from apron strings running back to headquarters in Detroit. The corporation, one of its executives recently told ELECTRONICS, is "firmly embarked" on a decentralization scheme.

The scheme traces back to mid-1956 when Burroughs bought Electrodata Corp., builder of Burroughs' Datatron. The thriving California computermaker had its own good management. To take advantage of it, Detroit executives had to let their new acquisition alone. They did—even turned over to Electrodata the merchandising of the homegrown series E computers (like the E101) and series G high-speed printers.

Trend upward for Borroughs' profit picture dates back a little further, to about ten years ago. The firm had fallen fairly low in the office equipment field before the war, dipped again when war contracts were dropped. A change of management in 1946 brought tough-minded salesman John William Coleman (picture) to the helm.

He moved in at a ripe time. Computers were just being born. Banks—long a mainstay of Burroughs' lucrative business in bookkeeping machines—were about to experience a nationwide upswing. Automation was in the air. Supply of engineers was growing daily shorter, and industry looked for tools to upgrade such engineers as they were lucky enough to have.

Coleman took a cold look around and decided to go after all the kinds of business the firm could get.

Manufacture of bookkeeping machines and desk calculators was stepped up. The machines were redesigned for compactness and efficiency, streamlined to appeal to also-scarce office help.

In the field of electronic computers, the firm first tried large-scale machines, built two UDEC's (still operative, one at Wayne University in Detroit, the other in Burroughs' Philadelphia labs). They proved prohibitive as far as engineering and manufacturing expense were concerned for a company of Burroughs' size. The firm cut its losses, went to work on the other extreme.

The desk-size E101, complete with magnetic drum memory and pinboard control, broke on the market in midwinter, 1954. Engineers in industrial research labs all over the country ate it up—over 200 of the machines have been installed so far.

Burroughs' climb parallels the E101's success. In 1954, it ranked

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187th among the nation's top industrial concerns. Last year it jumped to 147th place, was 63d in employment. Currently, the company employs 33,000 people. Last year the firm grossed $272.9 million, confidently expects to go over $300 million this year.

Killian: "No Panic . . ."

PRESIDENT's new assistant for science and technology is more administrator than scientist, has broad experience in the ticklish work of managing scientists and their programs.

James Rhyne Killian Jr. (picture) possesses a BS in business and engineering administration which he earned at Trinity College (now Duke University) and at MIT. The 53-year-old MIT president has won worldwide respect for his knowledge of science and scientists and his ability to marshall technological forces.

This ability will be put to its severest test as the U.S. speeds up its scientific program to meet Soviet challenges.

A quiet, almost shy man, he has unusual powers of concentration, can shift quickly from one scientific problem to another. "He is not easily surprised," says a close associate. "He takes in a new problem calmly and proceeds to act. There is no panic in his makeup."

This characteristic alone – in an atmosphere full of wurra-wurra – is enough to recommend him for the job that has been named, albeit inaccurately, that of "missile czar."

Acting president of MIT during Killian's tour in Washington is the Institute's chancellor, Julius Stratton, winner of the 1957 IRE Medal of Honor (ELECTRONICS, Mar. 20, p 10). Stratton established MIT's Research Laboratory of Electronics, was its director until he took over the chancellorship.

Clare Erects Carolina Plant

NORTH Carolina's low-pressure boom in electronics gets another shot in the arm as Chicago componentmaker C. P. Clare spreads out into its own plant in the Tarheel state.

Clare is building a $1.25-million production facility in Fairview, N. C., where the company has been working in leased quarters for two years. The 40,000-sq ft plant, 11 miles southeast of Asheville, will be completed next June.

Employment in the new facility will reach 400. Part of the two-shift work force will move into the building early next spring.

CBS Builds New Labs

CBS Laboratories will soon settle into new quarters in Connecticut, 55 minutes from its parent's New York headquarters. The Labs, research and development division of

BUSINESS MEETINGS

Dec. 2-5: American Rocket Society annual meeting; Hotel Statler, N. Y.

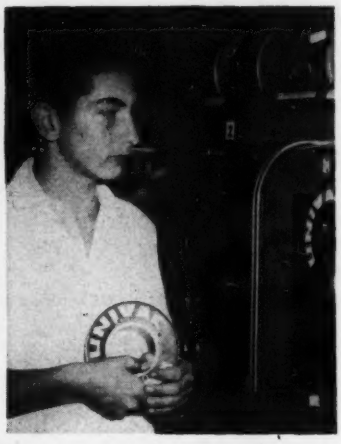
Dec. 9-13: Eastern Joint Computer Conference, Sheraton-Park Hotel, Washington.

Dec. 18-19: Electronic Industries Association (ex-RETMA) conference on maintainability. University of Southern California, Los Angeles.

Columbia Broadcasting System, will move into a million-dollar home near Stamford, Conn.

New lab will be ready for occupancy next summer. The 35,000-sq ft building will rise on a 11-acre site, will give the R&D activities twice the space now used in Manhattan.

The move is part of an expansion program for CBS' electronics research operations. Areas of research will include optics, solid-state physics, communications and data-processing, besides audio and video work.



Youth Tackles Technology

MUCH-DISCUSSED idea of reaching down into junior high schools to start the training of technologically adept youngsters was given a practical tryout last summer in Los Angeles. Result: "outstanding," according to A. R. Shriver, director of Remington Rand Univac's educational services in L. A.

Fourteen-year-old Bill Rosenberg, (pictured with a piece of the Univac) was admitted to a course in programming given at the computermaker's LA center. Director Shriver was impressed with Bill's "burning desire" to become a computer engineer. The gifted youth entered the 8-week course two weeks late (his family had taken a vacation in Yosemite, and he went along). "He emerged," comments Shriver, "with a truly outstanding record."

According to the two adult members of the three-man thesis team to which Bill was assigned, the youngster bears out the contention that "the gifted child is superior in more ways than one." Bill enjoys swimming and basketball.

His eventual goal is to invent a computer memory "smaller and better than anything yet devised."

Plant Briefs

INSTRUMENTMAKER **Electro Instruments** will shortly move into a new 43,000-sq ft plant in the Kearney Mesa development in north San Diego, Calif. New facility cost $500,000.

F-R Machine Works, Woodside, N. Y. adds 5,000 sq ft of manufacturing capacity for its signal and power source units.

In Newark, N. J., **National Moldite** moves its three manufacturing divisions—making ferrites, iron cores and molded coil forms—and its general offices into a leased 30,000-sq ft home four times the size of former quarters in Hillside, N. J.

Executive Moves

LAWYER **Charles C. Tillinghast Jr.** joins Bendix Aviation as v-p in charge of foreign investments and plants. **Charles Marcus** continues to be v-p for Bendix's foreign sales and licensing.

Clevite Corp. creates the job of electronics v-p, slips Clevite Research Center general manager **James K. Nunan** into the slot.

John Anderson becomes vice president of National Electronic Plastics, Matawan, N. J.

Physicist **James Humphrey** becomes director of research at Electronics Corporation of America.

Retiring Admiral **Arthur W. Radford** moves onto the board of Philco Corp.

Stanley J. Zak, general manager of Greenleaf Mfg. division of Mandrel Industries, becomes a Mandrel v-p.

EMPLOYMENT OPPORTUNITIES

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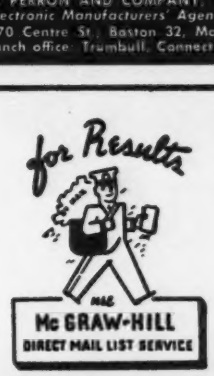

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Reps Spur Tube Sales

ELECTRON tubes haven't breathed anything like their last gasp in the running firefight against transistor competition. They're still good moneymakers for manufacturers' representatives.

DuMont has a new rep in New York state for its tubes and replacement parts. The nod goes to **LeRoy & McGuire,** Phelps, N. Y.

Tex-O-Koma Sales, Grand Prairie, Tex., takes on the power-tube line of Eitel-McCullough, covering Arkansas, Oklahoma, Louisiana and Texas.

Amperex line of tubes and semiconductors is now served by **Mel Pearson & Co.,** Denver, for west-central industrial accounts; by **Dwight Smith,** Aurora, Ill., for Illinois and Michigan distributor sales; and by **Thomas Beil,** Reading, Pa., for mid-Atlantic distributor accounts.

J-F Sales Co., Los Angeles, is new southern California rep for the inductor products of Electro-Winders Co., Covina, Calif.

California Chassis Co. appoints two new reps: **Harry Moore,** Phoenix, Ariz., covering Arizona, New Mexico and the El Paso area; and **Wes Alderson Co.,** Los Angeles, serving southern California.

Six new reps service Times Wire & Cable Co's line. **Mingins Sales,** Forest Hills, L. I., sells to the distributor trade in greater New York; the other five cover industrial accounts. **Components Inc.,** Cleveland, O., covers the Ohio Valley; Dallas rep firm **Delzell-Maynard Co.** handles manufacturers in Texas, Oklahoma, Louisiana and Tennessee; **J. F. Kerrigan,** Columbia, Conn., serves New England. In the midwest, **Memac Sales** will cover Illinois and southern Wisconsin. The California market is served by Santa Monica's **Electro-Rep Associates.**

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CLASSIFIED ADVERTISING

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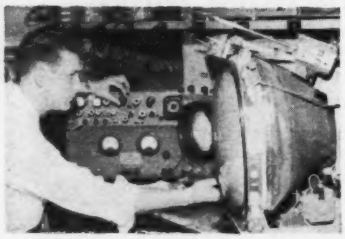
Coming In Our Dec. 1 Engineering Edition . . .

• **Practical Filters.** Anticipated performance is seldom achieved in passive filter circuits whose design is based solely on theoretical considerations. Distributed capacitance due to component proximity and encapsulating materials, temperature effects and impedance mismatch radically skew the results. Such pitfalls can be readily avoided by using the design and manufacture techniques described by S. Boyle of Radioplane. Calculated performance can be achieved by observing a few simple precautions.

• **Shrinking Transceivers.** Reflex circuit techniques permit design of 1,750-channel transceiver employing only 35 crystals and 28 tubes. Intended primarily for ground-to-air communications in the 225 to 400-mc range, unit designed by P. G. Wulfsberg and C. H. Kirkpatrick of Collins Radio may be installed in either fixed or mobile stations. The transmitter delivers at least 15 watts and the receiver has a sensitivity of better than 5μ v. The squelch circuit operates on signal-plus-noise to noise ratio.



Color set is checked out with signals from flat-field generator

• **Clamp-On Current Meter.** A small toroidal current transformer can be clamped around an unknown current to measure 0 to 200 microamperes over frequency range of 50 cps to 100 kc. Feedback to tertiary winding supplies frequency correction. The unit in operation at the National Bureau of Standards was developed by C. Stansbury and G. F. Montgomery.

• **Rapid Recovery.** A. I. Aronson and C. F. Chong of RCA have come up with a monostable multivibrator using complementary transistors. When used in a television sync generator erratic operation of the circuit is prevented. Since both transistors are off during timing cycle, circuit is relatively insensitive to transistor variations and operates reliably from minus 50 to plus 70 C for input frequencies from 250 cps to one mc.

• **Color TV Testing.** Experimental work on color television systems is facilitated by a generator that provides composite color video signals of any hue and saturation as well as luminance signal that is variable from black to white. Except for presenting only one color at a time, the Westinghouse instrument discussed by R. W. Cook can replace many functions of encoder or colorplexer in factories, laboratories and broadcast stations.